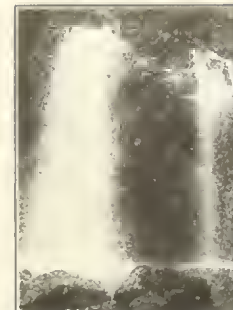
MONTANA WATER QUALITY 1994



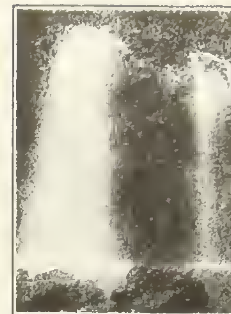
MONTANA
WATER
QUALITY
1 9 9 4

The Montana 305(b) Report
June 1994

Water Quality Division
Montana Department of
Health and Environmental Sciences
Helena, Montana 59620

MONTANA WATER QUALITY 1994

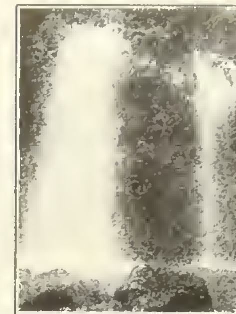
CONTENTS



MONTANA WATER QUALITY 1994

TABLE LIST

FIGURE LIST



MONTANA
WATER
QUALITY
1994

SUMMARY

The Montana water quality assessment 305(b) report has been and continues to be used for making watershed management decisions based on identified sources and causes of pollution in Montana. However, assessments have been completed on only a small percentage of Montana's lakes and stream miles.

Assessments in Montana

The Montana waterbody system (WBS) now contains assessments for 867 stream segments (17,680 miles) and 183 lakes (797,190 acres).

The use-classification system for Montana's water resources was not changed during the past two years.

Status of Water in Montana

Non-supporting stream segments in the Montana waterbody system total 925 miles or about 5% of the stream mileage that has been assessed. Streams identified as partially supporting constitute about 75% of the assessed stream mileage. The portion of the unassessed streams (159,070 miles) and lakes (47,612 acres) that are fully supporting their designated uses is unknown.

About 14% of the lake acres in the Montana waterbody system fully support fish and aquatic life, more than 50% support swimming and 62% support drinking water use.

Sources of Impairment

Agriculture has impaired 60% of the stream miles and 45% of the lake acres that have been assessed.

The majority of stream impairment (90%) and lake impairment (80%) is from nonpoint sources (NPS) of pollution.

Causes of Impairment

Nutrients, siltation, suspended solids, salinity, flow and habitat alterations and metals are the predominant causes of stream impairment in Montana.

The primary causes of lake impairment are nutrients, water level fluctuations, metals, suspended solids, nuisance algae and organic enrichment.

Natural arsenic, which for the most part originates in the geothermal regions of Yellowstone National Park, has impaired the drinking water use of much of the Missouri and Yellowstone river systems.

The Nonpoint Source Program

The NPS program has concentrated its efforts on the three major impairment sources: agriculture, mining and forestry.

During the past four years the NPS program has implemented a dozen watershed/demonstration projects, five groundwater projects and 43 educational activities/projects.

TMDL Development

Nutrient total maximum daily load (TMDL) development for the upper and middle Clark Fork River and Flathead Lake (a cooperative project with the Confederated Salish and Kootenai Tribes) is in progress.

Wetlands Activities

A variety of activities pertaining to wetlands began during the period, including: coordinating the collection of existing wetland information; collecting a baseline database of the least impaired wetlands; sponsoring wetland education programs, and providing an organizational structure that will allow existing wetland protection and management programs to better counter threats that exist.

Groundwater Quality

More than 50% of Montanans get their domestic water supply from groundwater sources. The most important aquifers are the alluvial aquifers that occupy river valleys throughout the state. Groundwater is plentiful and the quality is generally excellent.

At the same time, Montana's aquifers are very vulnerable to pollution from human activities. The challenge for Montana is to protect groundwater quality as more people and businesses move into the river valleys. The Department of Health and Environmental Sciences (DHES) and the Department of Natural Resources and Conservation are jointly preparing a Comprehensive Groundwater Protection Plan to address protection of groundwater quality and quantity. The plan is scheduled for completion in December 1994.

Changes in Water Quality

Water quality monitoring sponsored by the Department of Health and Environmental Sciences Water Quality Division (DHES\WQD) indicates copper concentrations have decreased in the Clark Fork River headwaters and phosphorus concentrations have decreased in the middle reaches. Flathead Lake productivity has increased. A U.S. Geological Survey-sponsored water quality trend analysis indicates improving conditions at several locations. However, the trends usually occurred at only one monitoring station for each parameter studied.

Watershed Planning

Watershed planning is being actively pursued in the Kootenai, Clark Fork, Flathead and Blackfoot River basins. Over the next two or three years, the Sun, Smith, Upper Missouri, Musselshell, Bitterroot and Lower Missouri River basins will also see beginning implementation of watershed planning and management programs.

Montana is the fourth largest state in the Union and remains sparsely populated with fewer than six people per square mile (Table 1). Urban development is primarily concentrated in a few western cities where recent growth has been rapid. The state's major economic base consists of recreation-tourism, agriculture, forest products and resource extraction. Hydropower and coal-fired generation plants are the dominant sources of electrical power.

Montana contains headwater streams for three North American river systems (Clark Fork-Pend Oreille-Columbia, Yellowstone-Missouri-Mississippi and St. Mary-Saskatchewan-Nelson). For management purposes, those three basins have been divided into 16 submajor basins which were further divided into a total of 85 minor drainage basins (Figure 1 and Table 2 on Pages 4 and 5).

Seven major regions of similar climate, geology and vegetation (ecoregions) are represented in Montana (Figure 2 on Page 6). Natural water quality associated with each ecoregion varies considerably, from sensitive, very low dissolved solids waters of the alpine and inter-mountain regions to waters with very high dissolved solids in some of the semi-arid regions.

Table 1
Atlas of Montana

Population[1]	839,000
Surface Area (sq. miles)	145,556
River Basins	
Continental	3
Major Sub-basins	16
Minor Basins	85
Miles of Streams[2]	
Total	176,750
Perennial	53,221
Intermittent	116,608
Ditches/Canals	6,921
Acres of Lakes[2]	
Total	844,802
Significant Publicly Owned[3]	833,964
Number or Lakes[2]	
Total	10,246
Significant Publicly Owned[3]	7,004
Acres of Wetlands[4]	840,300

[1] 1993 estimate.

[2] Derived from U.S. EPA Reach File version 3 (RF3).

[3] Perennial lakes >= 5 acres.

[4] Dahl, T.E. 1990. Wetlands Losses in the United States 1780s to 1980s. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 21 pp.

Figure 1

Drainage Basins of Montana

(see Table 2 for key to basin codes)

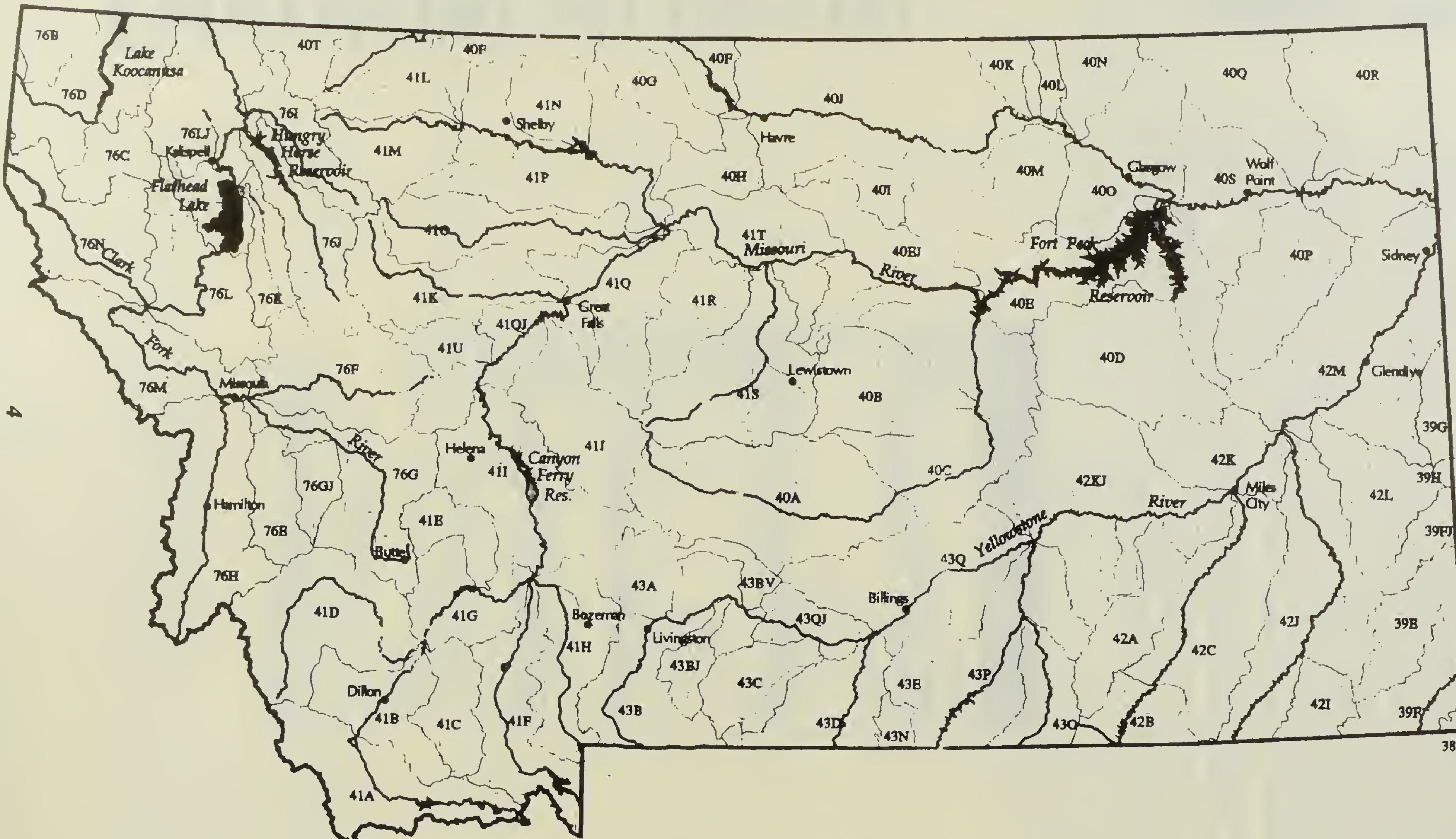
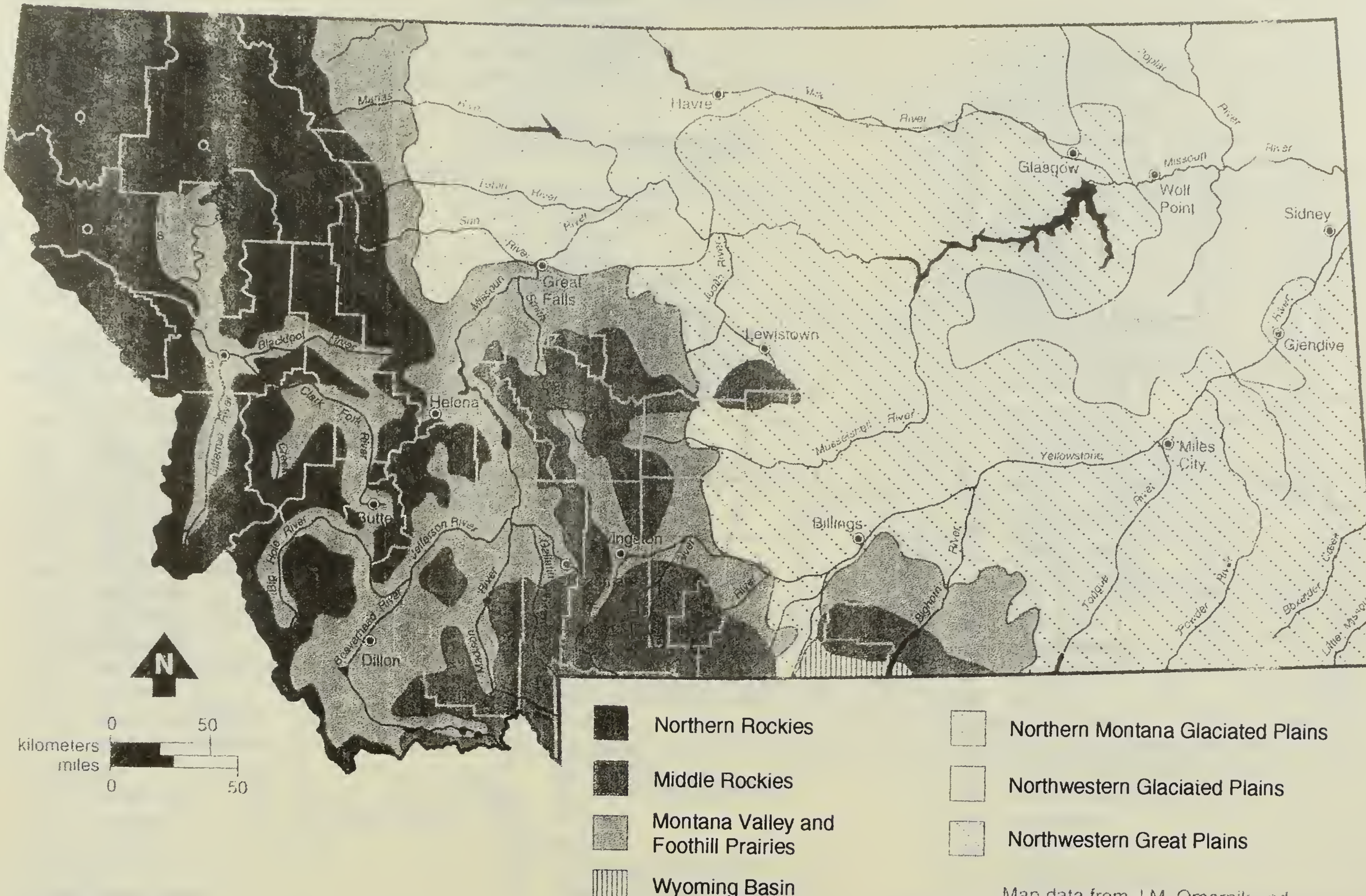


Table 2
Drainage Basins of Montana

COLUMBIA RIVER BASIN	
KOOTENAI	
76B	Yaak River
76C	Fisher River
76D	Kootenai River
FLATHEAD	
76I	Middle Fork Flathead River
76J	South Fork Flathead River
76K	Swan River
76IJ	Flathead River to and including Flathead Lake
UPPER CLARK FORK	
76E	Rock Creek tributary of Clark Fork River
76F	Blackfoot River
76G	Clark Fork above Blackfoot River
76GJ	Flint Creek
76H	Bitterroot River
LOWER CLARK FORK	
76L	Flathead River below Flathead Lake
76M	Clark Fork between Blackfoot River and Flathead River
76N	Clark Fork below Flathead River
MISSOURI RIVER BASIN	
UPPER MISSOURI TRIBUTARIES	
41A	Red Rock River
41B	Beaverhead River
41C	Ruby River
41D	Big Hole River
41E	Boulder River tributary of Jefferson River
41F	Madison River
41G	Jefferson River
41H	Gallatin River
MARIAS	
41L	Cut Bank River
41M	Two Medicine River
41N	Willow Creek
41O	Teton River
41P	Marias River
MUSSELSHELL	
40A	Musselshell River above Roundup
40B	Flatwillow Creek including Box Elder Creek
40C	Musselshell River below Roundup
MIDDLE MISSOURI	
40D	Dry Creek
40E	Missouri River between Musselshell River and Fort Peck Dam
41R	Arrow Creek
41S	Judith River
41T	Missouri River from Marias River to and including Bull Whacker Creek
40EJ	Missouri River between Bullwacker Creek and Musselshell River
MILK	
40F	Milk River above Fresno Reservoir
40G	Sage Creek
40H	Big Sandy Creek
40I	Peoples Creek
40J	Milk River between Fresno Reservoir and Whitewater Creek
40K	Whitewater Creek
40L	Frenchman Creek
40M	Beaver Creek Tributary of Milk River
40N	Rock Creek Tributary of Milk River
40O	Milk River below Whitewater Creek including Porcupine Creek
LOWER MISSOURI	
40P	Redwater River
40Q	Poplar River
40R	Big Muddy Creek
40S	Missouri River below Fort Peck Dam
ST. MARY-SASKATCHEWAN-NELSON RIVER BASIN	
SAINT MARY	
40T	St. Mary River
YELLOWSTONE RIVER BASIN	
UPPER YELLOWSTONE	
43A	Shields River
43B	Yellowstone River above and including Bridger Creek
43BJ	Boulder River Tributary of Yellowstone river
43BV	Sweet Grass Creek
43C	Stillwater River
43D	Clarks Fork Yellowstone River
43QJ	Yellowstone River from Bridger Creek to the Clarks Fork of the Yellowstone
MIDDLE YELLOWSTONE	
43E	Pryor Creek
43N	Shoshone River
43O	Little Bighorn River
43P	Bighorn River
43Q	Yellowstone River between Clarks Fork of the Yellowstone and Bighorn River
42A	Rosebud Creek
42B	Tongue River above and including Hanging Woman Creek
42C	Tongue River below Hanging Woman Creek
42KJ	Yellowstone River between Bighom River and Tongue River
LOWER YELLOWSTONE	
42I	Little Powder River
42J	Powder River below Clear Creek
42K	Yellowstone River betrween Tongue River and Powder River
42L	O'Fallon Creek
42M	Yellowstone River below Powder River
LITTLE MISSOURI	
39E	Boxelder Creek
39F	Little Missouri River above Little Beaver Creek
39FJ	Little Beaver Creek
39G	Beaver Creek Tributary of Little Missouri River
39H	Little Missouri below Little Beaver Creek
38H	Belle Fourche River above Cheyenne River

Figure 2
Ecoregions of Montana



Map data from J.M. Omernik and A.L. Gallant, U.S. EPA, 1987

During the past several years, the U.S. Environmental Protection Agency (EPA) has revised the total waterbody size estimates for the states. The EPA River Reach File (RF3) computer program provides the most recent waterbody size information available. It is the source of the stream and lake size estimates used in this report. The U.S. Geological Survey (USGS) 1:100,000 topographical maps were used to identify the surface water types and sizes reported in RF3. Because the original maps were made over a period of several decades, the coverage detail varies across the state. In some regions only larger intermittent or perennial streams and lakes were identified, but in others, nearly all steam and lake types and sizes were indicated on the maps. The regional resolution differences are most apparent when comparing first and second order ephemeral and intermittent streams.

Waterbody Types and Sizes

Streams

Streams can be separated into three general categories depending on the relative position of the stream bed to the local shallow groundwater table.

1. Ephemeral stream beds are always above the local shallow groundwater and flow only in response to snow melt or rain fall. Such streams are dry most of the year and are found extensively in semiarid regions of Montana.
2. Intermittent stream beds are below the local shallow groundwater table during part of the year and flow in response to groundwater recharge and precipitation. Most of the stream miles in Montana are first and second order ephemeral and intermittent streams.
3. Perennial stream beds are always below the local shallow groundwater table and typically have surface flow throughout the year. Perennial streams receive most of the water quality monitoring and assessment emphasis.

Stream reaches (of any stream type) may also be categorized by the relative size of the upstream watershed, using a stream ordering technique[1]. First order streams do not have tributaries and are commonly ephemeral or intermittent. The order of a stream reach changes at the confluence of two like order streams (i.e., a second order stream begins at the confluence of two first order streams, a third order reach begins after two second order stream meet and so on).

Table 3 (on page 8) shows the relative distribution of the stream orders in Montana. Figure 3 (on page 9) depicts the numbers of miles by stream order. The fact that Montana is a headwaters state is reflected in the large portion of the total stream miles made up by 1st order intermittent and perennial streams.

Lakes

The distribution of lake acres (including man-made reservoirs) by size categories (acres) is also presented in Table 3. Lakes do not have a system similar to stream orders for indicating lake or watershed size.

All lakes and reservoirs are part of the state's water resources, but most of the assessment emphasis has been focused on "significant publicly owned" lakes. These are lakes that have public access and recreation potential. Unfortunately, the RF3 database does not identify those lakes. Therefore, perennial lakes greater than or equal to five acres are designated as significant publicly owned lakes for the 1994 §305(b) report. This arbitrary subset of the total lake acreage may, in fact, contain private reservoirs or may exclude some alpine or pothole lakes on public lands. Until resources are available to undertake a state-wide lakes ownership survey, Montana will identify its "significant publicly owned" lakes as described above.

---

[1] Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. Amer. Geophys. Union Trans. 38:913-920.

Table 3
Distribution of Montana Streams and Lakes by Size

	Order						
	First	Second	Third	Fourth	Fifth	Sixth	Seventh
Total Miles of Rivers and Streams	112,240	31,512	17,243	8,744	3,833	735	2,444
Miles of Perennial Rivers/Streams	21,842	11,105	8,203	5,579	3,425	681	2,386
Miles of Intermittent Rivers/Streams	84,283	19,884	8,816	3,138	388	51	49
Miles of Ditches/Canals	6,115	524	224	27	20	9	9
Number of Lakes/Reservoirs/Ponds	3,242	3,296	3,311	287	47	55	8
Acres of Lakes/Reservoirs/Ponds	10,838	23,461	80,254	58,331	31,443	140,280	500,195

Lake /Reservoir/Pond Sizes:
First Order - 0 to 5 acres
Second Order - 5 to 10 acres
Third Order - 10 to 100 acres
Fourth Order - 100 to 500 acres
Fifth Order - 500 to 1,000 acres
Sixth Order - 1,000 to 10,000 acres
Seventh Order - Greater than 10,000 acres

The Montana Waterbody Tracking System

Identifying streams and lakes under the general heading "waterbodies" provides a flexible method for tracking Montana's waters on a watershed, stream (or lake) or stream reach basis. The current waterbody tracking system was developed by the EPA for use by states. The conversion of earlier tracking system data to the present version was done by EPA contractors at Research Triangle Institute, NC (RTI).

The principal use of the Montana Waterbody System (WBS) is maintaining information about the level of use supported by the streams and lakes of the state.

In the WBS database, each of Montana's 85 minor basins (Figure 1 on page 4) generally has three waterbody designations associated with it:

1. the main stem of the predominant stream (only),
2. the main stem and tributaries, and
3. the lakes of the watershed.

The main stem and tributaries waterbody is further divided into segments which usually are tributary streams or lakes. For example, the waterbody identifier MT43C001-6 represents East Rosebud Creek (segment 6) of the main stem and tributaries waterbody (001) of the Stillwater River watershed (C) of the upper Yellowstone River basin (MT43).

The data now stored in WBS represent about 17,700 stream miles and 800,000 lake acres. Because the main emphasis of WBS has been tracking impaired or threatened waterbodies and the sources and causes of pollution, only a small portion of the database describes unimpaired waterbodies.

Most of the information in WBS is from second order and greater intermittent and perennial streams. That subset of the state's total waters (about 64,000 miles) is most likely to have sufficient water year round to naturally support designated uses (especially aquatic life and fisheries) and has received most of the assessment emphasis.

WBS does not accommodate analytical data. Rather, use-support conclusions are made using data and information entered into WBS from other sources. A wide variety of information sources are used, including Water Quality Division sponsored intensive surveys; NPS stream reach assessments; information from Conservation Districts; a lake database maintained by the Montana Department of Fish, Wildlife and Parks (DFW&P); U.S. Forest Service (USFS) and Bureau of Land Management (BLM) data; USGS data, and data from the EPA national water quality database STORET.

Sources of pollution are activities that produce pollutants. Municipal wastewater treatment plant and industrial discharges are common point sources and are regulated by the Montana Pollutant Discharge Elimination System (MPDES) permitting program. Agriculture, timber harvesting and resource extraction activities are common nonpoint sources of pollution. More than one source may impact a waterbody at one time (e.g., a municipal wastewater treatment plant's (WWTP) discharge and area agriculture may both produce pollutants that find their way into a lake).

The amount each source contributes to impairment of a waterbody's uses is ranked using high (H), moderate (M), slight (S) and threatened (T) designations. The threatened magnitude does not mean that an indicated source is responsible for use impairment. Rather, it means that additional similar sources, expanded sources or inadequate control of existing sources may impair future uses.

The *causes* of pollution are defined as measured contributors to use impairment including heavy metals and toxins, decreased dissolved oxygen or reduced riparian habitat. Often, several causes of impairment may be generated by a single source. Or, the impact of an upstream cause may overlap the same cause from another source. The relative magnitude of each cause's impact on water quality is ranked using H, M, S and T as described above.

Because of the sheer size of Montana's water resources and the extremely limited monitoring and assessment capabilities available, many of the state's waterbodies have not been assessed and recorded in the WBS. Because of the uncertainty involved, this rather large total waterbody size (159,070 miles) is not included in the use support summary tables. As information becomes available about each specific waterbody, it will be added to the WBS database.

A large portion of Montana (approximately 25%) is owned by several Federal agencies (including the USFS, National Park Service and BLM) which manage several wilderness areas, roadless areas and parks. The streams and lakes in these pristine areas as well as other remote areas are, in all likelihood, fully supporting their designated uses. However, because assessments have not been completed and the waterbody size is unknown, they are not reflected in the WBS fully supporting category.

Figure 3
Distribution of Streams by Order

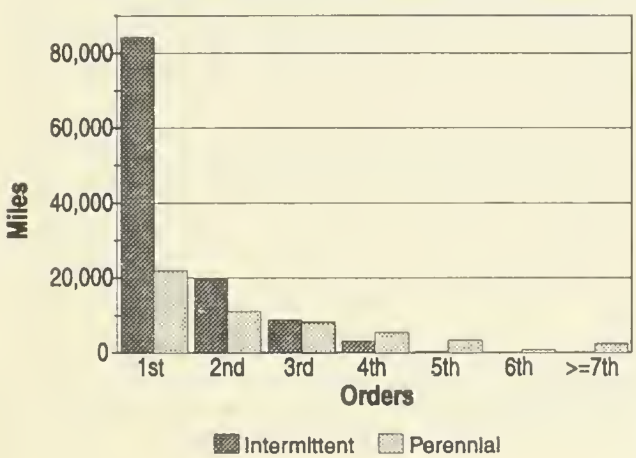
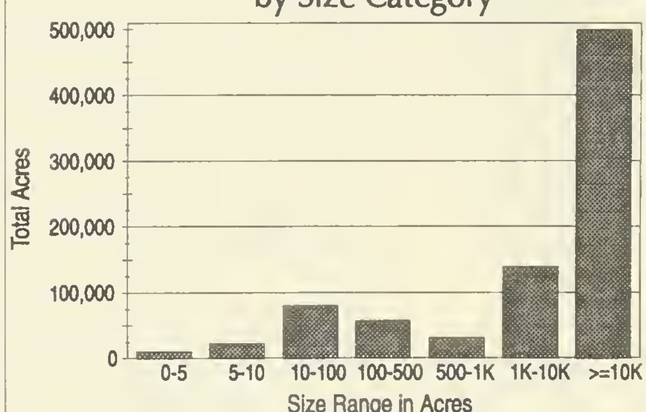
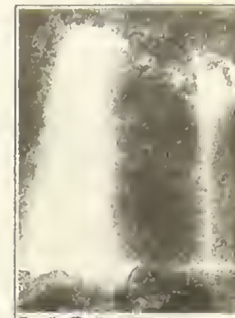


Figure 4
Acres of Perennial Lakes by Size Category





Montana Water Classification System and Water Quality Standards

Background

The Montana Water Quality Act (including 1993 revisions) establishes general guidelines for water quality protection. It requires the Montana Board of Health and Environmental Sciences to adopt rules to protect the quality of the state's waters as well as present and future beneficial uses. The Act also directs the Board to establish permit and nondegradation policies. Surface and groundwater use classification systems and water quality standards and criteria are defined in the Administrative Rules of Montana, Title 16, Chapter 20, Subchapters 6 and 10, respectively.

The present use classification of each waterbody in Montana was assigned according to the actual and anticipated uses in 1955.

The use classifications and water quality standards for Montana's surface and groundwaters have not been modified during the past two years. However, groundwater quality standards, mixing zone regulations and nondegradation policy were revised in 1994.

Surface Water Classification System

The surface water use classification system employs four basic categories: A, B, C and I (Table 4 on Page 12) which are based primarily on water temperature, fisheries and associated aquatic life. The B and C classifications are subdivided into cold water B-(1 or 2) and C-(1 or 2) and warm water B-3 and C-3.

Comparison of water quality criteria common to each use classification is presented in Table 5, and a brief description of the surface water use classification system and associated standards follows.

The A-Closed and A-1 waters are very high quality, and the principal beneficial use is domestic. Watershed protection and use restrictions that may be authorized by the A classifications are intended to protect the principal beneficial use.

The B-(1, 2 and 3) classifications are multiple use waters suitable for domestic use after conventional treatment, growth and propagation of fish (cold water, B-1 and B-2, warm water, B-3), associated aquatic life and wildlife, and agricultural and industrial uses. Most streams in Montana have been classified as B-(1, 2 or 3).

Only four stream segments have been classified as C-1 or C-2. They are:
1. Lower Rainy Creek (C-1)
2. Clark Fork River (C-2) (from Warm Springs Creek to Cottonwood Creek)
3. Clark Fork River (C-1) (from Cottonwood Creek to the Little Blackfoot River)
4. Ashley Creek (C-2)

The difference between B-(1 or 2) and C-(1 or 2) is that the B classifications include drinking water as a beneficial use and the C classifications do not. All other uses are common to both classifications.

C-3 streams are naturally high in total dissolved solids and may support warm water (non-salmonid) fisheries. Because of naturally high total dissolved solids, these waters have been recognized as marginal for drinking, agricultural and industrial uses.

Streams with an I (impacted) classification were impacted by an activity which would not allow the stream to fully support drinking, recreation or fishery uses at the time the first stream classifications were determined (1955). The state's goal is to improve the quality of these waterbodies so that they will fully support all appropriate beneficial uses.

Three stream segments have been designated as I: Prickly Pear Creek below East Helena, Silver Bow Creek, and Muddy Creek.

Water quality standards specific to lakes and wetlands have not been developed; therefore, surface water quality standards described here apply to all waterbody types. Work is progressing on water quality standards that will specifically address wetlands.

Work is also in progress on developing more specific biocriteria for Montana streams, lakes and wetlands which will replace the general phrase "...growth and propagation of salmonid (or non-salmonid) fishes and associated aquatic life..." in the current surface water quality standards.

Groundwater Classification System

Groundwater is classified according to actual quality and use as of October 1982. The classifications are Class I, II, III and IV.

Class I groundwater is suitable for public and private water supplies, food processing, irrigation, etc., with little or no treatment required. Specific conductance is less than 1000 μSiemens/cm at 25°C.

Class II groundwater may be used for public and private water supplies where better quality water is not available. The primary use is for irrigation, stock water and industrial purposes. Specific conductance range is 1000 to 2500 μSiemens/cm at 25°C.

Class III groundwater is used primarily for stock water and industrial purposes. Specific conductance range is 2500 to 15,000 μSiemens/cm at 25°C.

Class IV groundwater is used primarily for industrial purposes. Specific conductance is greater than 15,000 μSiemens/cm at 25°C.

Nondegradation Policy

During the 1993 Montana legislative session, the Water Quality Act's nondegradation policy (75-5-303) was rewritten. The revised policy clarifies several issues:

1. All uses must be protected, and the water quality necessary to attain those uses must be maintained.
2. Specific conditions or criteria (established by the legislature) must be met to allow a reduction in existing water quality.
3. A decision process must be followed which includes public notice and a comment period and allows attachment of conditions to a nondegradation authorization.
4. A specific decision appeal process is now in place.
5. A nondegradation authorization review requirement and time table is now in place.
6. The Board of Health is to adopt the necessary rules to implement the nondegradation policy.

Table 4
Surface Water Use Classifications Summary for Montana

A-CLOSED CLASSIFICATION:	Waters classified A-Closed are suitable for drinking, culinary and food processing purposes after simple disinfection.
A-1 CLASSIFICATION:	Waters classified A-1 are suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities.
B-1 CLASSIFICATION:	Waters classified B-1 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
B-2 CLASSIFICATION:	Waters classified B-2 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
B-3 CLASSIFICATION:	Waters classified B-3 are suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
C-1 CLASSIFICATION:	Waters classified C-1 are suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
C-2 CLASSIFICATION:	Waters classified C-2 are suitable for bathing, swimming and recreation; growth and marginal propagation ol salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
C-3 CLASSIFICATION:	Waters classified C-3 are suitable for bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers. The quality of these waters is naturally marginal for drinking, culinary and food processing purposes, agriculture and industrial water supply.
I CLASSIFICATION:	The goal of the State of Montana is to have these waters fully support the following uses: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

Source: Montana Surface Water Quality Standards, Administrative Rules of Montana, Title 16, Chapter 20.

The Board and the Water Quality Division recently updated the use classification rules and adopted new nondegradation policy rules. Adoption of the new rules and repeal of the existing rules took place in 1994.

In conjunction with the nondegradation rulemaking process, the numeric surface water quality criteria previously referenced in the "Gold Book" and other EPA documents have been consolidated into a single department circular, WQB-7, *Draft Montana Numeric Water Quality Standards* (April 4, 1994 edition). The document greatly simplifies locating numeric water quality criteria and associated methods of analysis that are required to make use support decisions.

If detailed information about the Montana Water Quality Act or the Administrative Rules is needed, please contact the MDHES, Water Quality Division, Cogswell Building, Capitol Station, Helena, MT, 59620.

Table 5
Comparison of Specific Criteria Common to Each Use Classification

			MAX INCREASE			MAX CHANGE		
Class	Coliform Bacteria	Min D.O.	Turb	Color	Sediment	Temp	pH*	Toxics
A-Closed	50/100ML	NC	Ni	NI	NI	NI	0.5	WQB-7
A1	200/100 ML	7.0 mg/l	NI	2 Units	NI	1° F	0.5	WQB-7
B1	200/100 ML	7.0 mg/l	5 Units	5 Units	NI	1° F	0.5	WQB-7
B2	200/100 ML	6.0 mg/l	10 Units	5 Units	NI	1° F	0.5	WQB-7
B3	200/100 ML	5.0 mg/l	10 Units	5 Units	NI	3° F	0.5	WQB-7
C1	200/100 ML	7.0 mg/l	5 Units	5 Units	NI	1° F	0.5	WQB-7
C2	200/100 ML	6.0 mg/l	10 Units	5 Units	NI	1° F	0.5	WQB-7
C3	200/100 ML	5.0 mg/l	10 Units	5 Units	NI	3° F	0.5	WQB-7
I	200/100 ML	3.0 mg/l	NI	NI	NI	NI	2	WQB-7

*Maintained between 6.5 and 9.5

NC = No Change
NI = No Increase

Aquatic life support, fisheries, swimming and drinking water are generally the designated uses with the highest water quality requirements. When they are fully supported, all other uses (e.g., agricultural and industrial) are, by definition, fully supported as well.

Aquatic Life Support

Aquatic life support is a broad descriptor intended to protect aquatic plant and animal communities (e.g., game and non-game fish and other aquatic animals and plants) normally associated with a high quality ecosystem.

Fisheries

In Montana, fisheries use has been divided into cold-water and warm-water fisheries. Cold-water fisheries are commonly mountain or foothill streams and lakes that support "trout" (e.g., cutthroat, bull trout or arctic grayling) and associated non-game fish.

The eastern prairie streams and lakes and major rivers are commonly referred to as warm-water fisheries. These waterbodies are naturally warm, have high suspended sediment and total dissolved solids and typically support sauger, catfish and a wide variety of non-game fish.

Swimming and Recreation

Swimming use, in this report, also includes secondary contact recreation (boating). The use may be impaired by aesthetics (noxious algae growth) or health concerns (fecal coliform bacteria).

Drinking Water

Drinking water use is the fourth major use category assessed for the §305(b) report. Drinking water use support is usually determined by comparing a parameter maximum contaminant level (MCL) and human health criteria to the value of a water column sample. A water quality MCL is the maximum concentration of a parameter (e.g., copper or nitrate) the EPA has found to be safe for human consumption. The values are usually based on toxicity tests.

Human health criteria refer to the concentration of a carcinogen (e.g., arsenic or a pesticide) that has been correlated to a specific level of risk (in Montana a risk level of one to one million) to develop cancer as a result of life long exposure to the parameter.

Guidelines for Determining Use Support

The Department of Health and Environmental Sciences Water Quality Division has adopted EPA guidelines for making waterbody designated use support decisions[2] used in this report. The guidance attempts to take into account the natural variability of water quality parameters and the lack of a complete or extensive database.

Three general data types are used in the assessment process: toxics and carcinogens; conventionals, and non-traditional. Each of the data types has individual guidelines for interpretation and use support decision making.

Toxics and Carcinogens

Use support decisions based on toxics or carcinogen data are generally the most conservative. It is better to be overly protective than to miss a potentially harmful waterbody. For example, if the human health criterion of a carcinogen is below the analytical detection limit (1µg/L) and the analysis result of a sample is 2µg/L, the waterbody would be assessed non-supporting of drinking water use.

[2] Guidelines for preparation of the 1994 state water quality assessments (305(b) reports). U.S. EPA/841-B-93-004.

Most acute toxicity criteria are above the normal analytical detection limits; therefore, a value equal to or greater than the criteria is a violation, and a non-supporting designation is assigned for uses affected. Under most conditions, a waterbody will either fully support or will not support its uses when toxics or carcinogens are being considered.

Conventionals

The conventional pollutants (dissolved oxygen, pH, temperature, turbidity and sediment) are normally allowed a small number of criteria violations (10% of the database) or decisions are based on mean or median values to reduce the risk of incorrectly assessing a waterbody before the waterbody is designated as partially supporting. If 25% or more of the data for each parameter exceed the criteria, the waterbody will be designated as not supporting the affected use or uses.

Non-Traditional Water Quality Parameters

The use of aquatic life support assessments based on non-traditional water quality parameters is increasing as understanding of the impacts (e.g., reduced riparian vegetation, decreased stream depth, increased width, and straightening) on the aquatic communities improves. Assessments based on these non-traditional parameters use an unimpaired or least impaired reference waterbody for comparison. The percent similarity between reference stream and comparison stream metrics (indices calculated from the species present, number of individual organisms, and relative distribution of the organisms) are used to determine the condition of the waterbody being assessed. The critical values (Σ(test/reference metric)/number of metrics) used are:

>83 % of the reference = non-impaired or fully supporting
83-17% of the reference = impaired or partially supporting
<17% of the reference = severely impaired or non-supporting

Because macroinvertebrate and periphyton assemblages are able to integrate the effects of several stressors over time, they are good long-term water quality indicators. The metrics are especially good when a closely matched reference stream or upstream control site is used for comparison.

Periphyton and macroinvertebrate metrics and their interpretation are described in greater detail in the Periphyton Bioassessment Methods for Montana Streams[3] and Rapid Bioassessment Protocols for Use in Streams...[4]

Use Support Categories

Four categories of use support describe Montana's waters:

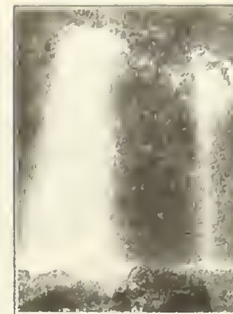
1. Fully supporting: uses are at their natural condition or best practical condition and water quality standards are not being violated.
2. Threatened but fully supporting: uses are fully supported but a new activity or increase in existing activities may result in water quality standard violations or use impairment.
3. Partially supporting: uses are not being supported at natural or best practical levels (e.g., water quality standards are not being met). This is a broad designation, used in situations in which waterbodies are slightly impaired to situations in which a waterbody is very nearly not supporting a designated use. For the purposes of the state's reporting requirements, the degree of partial impairment is not indicated in the summary tables. However, the §303(d) list of water quality-limited waterbodies has the relative magnitude of the sources and causes of impairment indicated (Appendix A).
4. Non-supporting: a waterbody that has acute toxics or human health criteria violations, where biological or physical data indicate severe degradation, or where other data indicate that water quality standards are violated and one or more uses cannot be attained. A three-year study and observation period has been recommended by the EPA before removing a non-support designation. The reason for the period is that most biological systems need a recovery period after exposure to acutely toxic substances or for the aquatic community to re-establish itself after a severe disturbance.

All waters of Montana are classified for multiple use. Therefore, the level of support of each designated use for a waterbody must be determined. The support decision for each use is independent of the other designated uses (e.g., a waterbody may partially support aquatic life because of excess nutrients, not support drinking water because of arsenic, but fully support agriculture and industrial uses).

---

[3] Bahls, L.L. 1993, revised. Periphyton bioassessment methods for Montana streams. Montana Dept. of Health and Environmental Sciences, Water Quality Bureau, Helena, MT.

[4] Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates and fish. U.S. EPA/440/4-89/001.



Surface Water Quality Assessment Programs

Stream assessment is the process of gathering information about a waterbody and determining whether or not water quality standards, criteria or beneficial uses identified by the Montana Water Quality Act and Administrative Rules are being supported or to what degree a designated use may be impaired.

Assessment Types

Two general categories of water quality assessments are used in Montana based on the quality and quantity of available data (Figure 5).

Four approaches have been used to gather the information needed for the monitored or evaluated water quality assessments: long-term fixed station monitoring, NPS stream reach assessments, intensive surveys and volunteer monitoring. Each approach shares the common goal of providing quality information about Montana's water resources.

Monitored Assessments

Monitored assessments are data intensive and often use fixed station monitoring or intensive surveys as the principal data source.

Fixed station

Fixed station monitoring has specific sampling sites identified, and the sites are monitored on a periodic basis (e.g., quarterly or monthly), usually for several years. Water Quality Division fixed station monitoring has concentrated on the Clark Fork River Basin including Flathead Lake.

Fixed station monitoring in Montana

The Clark Fork River headwaters are near Butte, Montana. The river flows northwest, draining approximately 25,000 square miles of Montana west of the Continental Divide. Three major rivers join with the Clark Fork River (the Bitterroot River, the Blackfoot River and the Flathead River) to make it the largest river flowing out of the state. Water quality in the basin varies from streams severely polluted by heavy metals to extremely pure mountain streams with excellent trout fisheries.

More than 30 fixed monitoring stations have been sampled (for heavy metals, nutrients and suspended sediment) at least monthly since 1988 along the Clark Fork River and many of its tributaries. Macroinvertebrate (aquatic insects) and periphyton (algae attached to rocks) have also been collected each summer from most of the stations. The data have become the foundation upon which a basin-wide management plan and nutrient Total Maximum Daily Load (TMDL)(under development) are based.

Figure 5
Assessment Types

Evaluated Assessment
(Used when site-specific data are marginal, old or lacking)

Based On
- Best Professional Judgement
- Land Use Information
- Volunteer Collected Data (Minimally Supervised)
- Complaints (Substantiated)
- Models That Have Not Been Ground Truthed
- Stream Reach Assessments (Only)

Monitored Assessment
(Used when recent, quality data are available.)

Based On
- Fixed Station Monitoring
  - Quarterly or More Often
- Intensive Surveys
  - Water Column Chemistry
  - Macroinvertebrate/Algae
  - Stream Reach Assessment

Flathead Lake and its tributaries also have an extensive fixed station monitoring program sponsored by the Water Quality Division and other agencies and carried out by the University of Montana Biological Station.

Flathead Lake is an important resource in northwest Montana and may be one of the last large oligotrophic lakes left in the United States. The lake monitoring program has been designed to document change in water quality (productivity) and has become the basis for the development of a nutrient TMDL (cooperatively with the Confederated Salish and Kootenai Tribes) and a basin-wide management plan.

A more complete discussion of Flathead Lake may be found in the lakes section of this report and in reports produced by the Flathead Basin Commission.

Intensive Surveys

Intensive surveys are multimedia, single-visit assessments and are usually categorized as monitored assessments. A combination of water column chemistry, macroinvertebrate and periphyton samples may be collected depending on the apparent condition of the stream as well as a stream reach habitat assessment. Macroinvertebrate samples are usually collected using the Rapid Bioassessment III techniques[5]. The combination of these data types will yield a comprehensive picture of the stream's condition at the time of the assessment and into the recent past.

Biological information is becoming the principal component in the assessment process because macroinvertebrate and algal communities are not able to avoid unfavorable conditions. When a biological community is exposed to stress, the sensitive species may die out and tolerant species will, in turn, dominate. The changes observed may range from extremely reduced numbers of very tolerant species because of pesticide or heavy metals pollution to very abundant numbers of a few species caused by nutrient pollution.

As more biological and corresponding habitat data are collected, the accuracy of the data interpretation and the understanding of the water chemistry-habitat-biological community relationship will improve.

Selection of streams for intensive surveys have followed a modified rotating basin approach. The number of streams and lakes in Montana makes it impossible to study each submajor or minor basin in great depth on a five- or even 10-year cycle. Rather, by dividing the state into five regional watersheds (west of the Continental Divide, northwest, northeast, southeast and southwest) and intensively surveying four or five streams in each region per year (20-25 total streams per year), the majority of minor basins will be studied in five years. Trend development will be slow at best (25 years for only five data points). The biological and habitat information collected may prove to be the best indices of waterbody trends.

Evaluated Assessments

Evaluated assessments are based on a less extensive data set and are the most common type of assessment used in Montana.

Stream Reach Assessments

The nonpoint source (NPS) stream reach habitat assessment procedure has become an important tool for identifying steams impaired by NPS pollution. The procedure uses riparian habitat and streambed condition as indicators of aquatic life use support. It is based on the premise that a stream with high quality riparian habitat, stable channel and no obvious NPS pollution sources will fully support a healthy aquatic life community. The assessment procedure works best with smaller streams (i.e., fourth order or less) that are not impacted by point source discharges.

Stream reach habitat assessments have been used throughout Montana including western mountain streams impacted by logging and eastern plains streams impacted by grazing. The Water Quality Division realizes that the assessment process has several subjective elements which are open to interpretation, therefore the information is used primarily as a first-round evaluation and for watershed prioritization or to support traditional chemical and biological sampling.

Volunteer Monitoring

Volunteer monitoring of Montana's water resources has been growing. The Canyon Ferry Limnological Institute (CFLI) has been collecting data from Canyon Ferry (near Helena) and more than 20 other lakes statewide. The institute has a high quality analytical laboratory and has an established quality assurance and quality control program. A portion of the Institute's funding has been through the Water Quality Division's Clean Lakes Program.

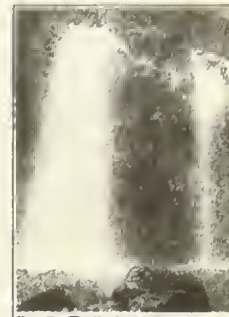
The Flathead Basin Commission started a lake volunteer monitoring program in 1992. A similar program was begun by the Kalispell office of the Montana Department of Fish, Wildlife and Parks in 1993. Together, those programs are collecting data on more than 20 lakes in northwest Montana.

[5]Plafkin, J.L., M.T. Barbour, et.al., Rapid Bioassessment Protocols For Use In Streams And Rivers: Benthic Macroinvertebrates And Fish, May 1989, Office of Water, EPA/440/4-89/001.

Volunteer monitoring programs in the Kootenai, Yellowstone and Bitterroot river basins are in various stages of development.

Other Sources of Assessment Data

Water quality studies and monitoring programs are also sponsored by several other agencies including the U.S. Forest Service, Montana Department of State Lands, Montana Department of Natural Resources and Conservation, U.S. Bureau of Land Management, the Soil Conservation Service and others. Information obtained from those agencies has been welcomed and has been incorporated into the Waterbody System.



To date, Montana's Waterbody System (WBS) contains assessments for 867 stream segments, totaling 17,680 miles of which 14,154 have been identified as threatened or impaired (Table 6). Evaluated stream segments outnumber monitored segments by 2½ to one. As the numbers indicate, the miles in the WBS that are not fully supporting their designated uses far exceed those that are. The mileage indicated as evaluated or monitored and fully supporting in the WBS is not representative of the true condition of Montana's waters (i.e., most of the healthy stream miles have not been entered into the WBS).

Table 6
Use Summary Report:
Aquatic Life Support, Rivers & Streams

Total Number of Stream Segments Assessed	866		
Number Monitored	249		
Number Evaluated	617		
	Miles		
Degree of Use Support	Evaluated	Monitored	Total
Fully Supporting	2,718	807	3,526
Supporting but Threatened	78	115	193
Partially Supporting	9,267	3,770	13,037
Not Supporting	668	257	924
Total Size Assessed	**12,731**	**4,949**	**17,680**

Level of Use Support

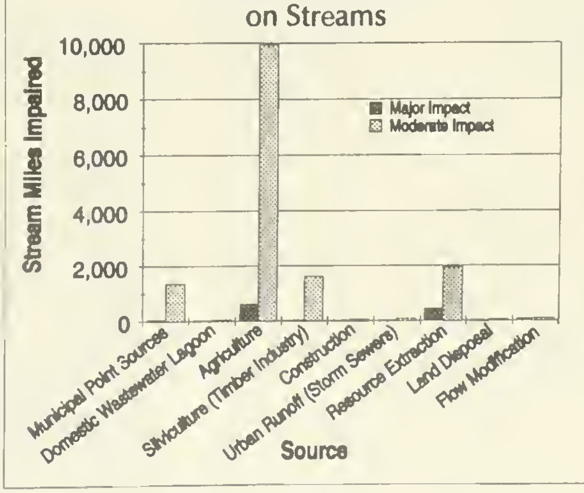
Non-supporting stream segments total less than 1,000 miles or about 5% of the stream mileage that has been assessed. Identified partially supporting stream miles constitute about 75% of assessed stream miles. The uses most commonly impaired are aquatic life support, fisheries and drinking water (Figure 7 on Page 22).

Sources

Of all the potential sources of water pollution, four general categories account for 90% of the impaired miles. Agriculture alone accounts for nearly 75% of the impairment (Figure 6). The general categories in Figure 6 have been divided into several more specific categories (Table 7 on Page 22). Irrigated crop production and range land affect the largest number of stream miles of the sub-categories. Collectively the sources that affect the vast majority of stream miles (nearly 90%) are nonpoint sources (i.e., the causes of impairment originate from broad areas).

Because the impact of one source may overlap another, the sources and indicated mileages cannot be added.

Figure 6
Impact of Major Pollution Sources on Streams



Causes

The causes of use impairment that have been identified are listed in Table 8 (on Page 23). Several of the causes listed have similar impacted sizes (e.g., six causes impact greater than 5,000 miles) which indicates that most streams are impacted by more than one cause.

Very few causes are specific to a single source. Therefore, the individual causes cannot be linked to a source without more information than is normally collected in the assessment process.

For example, forest practices, grazing and irrigated crop production may be sources of suspended sediment and nutrients in a stream. However, to isolate and quantify the pollutants that each source produces would require a moni-

Figure 7
Support by Category of Use

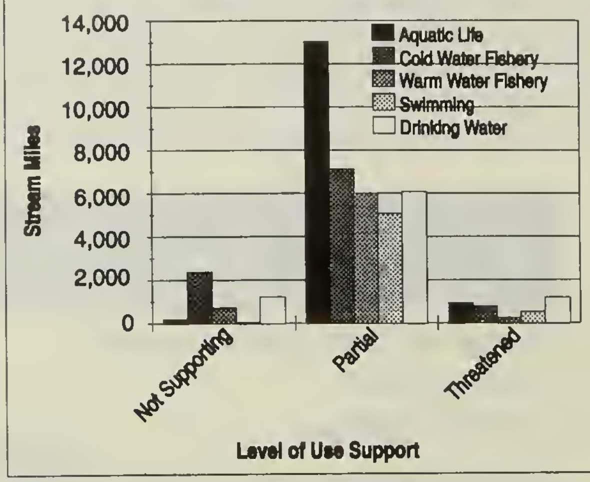


Table 7
Summary of Sources

Source Categories	Impact: Major	Impact: Moderate/Minor
INDUSTRIAL POINT SOURCES	6	339
MUNICIPAL POINT SOURCES	46	1347
DOMESTIC WASTEWATER LAGOON	26	38
AGRICULTURE	595	9940
Non-irrigated crop production	6	1941
Irrigated crop production	349	6973
Pasture land	51	829
Range land	103	6162
Feedlots (confined animal feeding operations)	0	89
Aquaculture	0	9
Animal holding/management areas	8	163
SILVICULTURE (Timber Industry)	26	1614
Harvesting,restoration residue management	0	247
Road construction/maintenance	0	252
CONSTRUCTION	0	35
Highway/road/bridge	12	1238
Land development	0	384
URBAN RUNOFF/STORM SEWERS (NPS)	0	83
Non-industrial permitted	0	38
Other urban runoff	0	23
RESOURCE EXTRACTION	419	1946
Surface mining	6	152
Subsurface mining	237	303
Placer mining	64	241
Dredge mining	26	172
Petroleum activities	15	505
Mill tailings	72	268
Mine tailings	54	265
LAND DISPOSAL	0	57
Wastewater	0	32
Landfills	0	13
Industrial land treatment	3	0
On-site wastewater (septic tanks)	0	139
Septage disposal	0	15
FLOW MODIFICATION	62	90
Channelization	25	678
Dredging	0	32
Dam construction	19	462
Flow regulation/modification	145	1673
Bridge construction	0	6
Removal of riparian vegetation	0	521
Streambank modification/destabilization	94	3801
Atmospheric deposition	7	0
Highway maintenance and runoff	0	148
Contaminated sediments	4	0
Natural	822	6338
Upstream inpoundment	24	348

toring program far greater than is presently possible.

Fish Kills

Fish kills reported to the Montana Department of Fish, Wildlife and Parks during 1992-1994 are presented in Table 9. (For more information about any of these fish kills, contact FW&P-Fisheries Division in Helena.)

Table 8
Summary of Causes

Cause Categories	Impact: Major	Impact: Moderate/ Minor
Priority organics	0	52
Nonpriority organics	0	39
Metals	923	4001
Un-ionized ammonia	46	330
Other inorganics	283	3643
Nutrients	104	6056
pH	36	689
Siltation	421	6549
Organic enrichment/DO	47	852
Salinity/TDS/chlorides	357	4841
Thermal modifications	81	2508
Flow alteration	519	6697
Other habitat alterations	437	5228
Pathogens	8	1597
Taste and odor	0	141
Suspended solids	369	6465
Noxious aquatic plants	0	158
Turbidity	0	38

Catch-and-release fishing regulations remain in effect for Silver Creek (tributary to Hauser Lake) because of mercury contamination from past mining activities. To date, those regulations constitute the only fish consumption ban in Montana.

The total waterbody size affected by toxics is presented in Table 10. Stream miles with elevated levels of toxics are divided into two general categories: man-caused and natural. The principal man-caused toxics are heavy metals and arsenic associated with metals and coal mining.

Natural sources of arsenic are responsible for most toxics impact on waterbodies in Montana. Geothermal sources associated with the Greater Yellowstone Ecosystem have impacted the Madison, Yellowstone, and Missouri Rivers and geologic materials in the watersheds of the Milk, Powder, and Tongue Rivers have contributed arsenic to the associated waterbodies.

Table 9
Fish Kills and Causes*

1992	
Cottonwood Creek near Deer Lodge, March	Chlorine toxicity from washed water line
Magpie Creek near Bonner Campground, September	Unknown cause
Three Forks Ponds, August	Low dissolved oxygen and H_2S
Missouri River, below Hauser Dam, August	Possible pH caused by lime
Little Prickly Pear Creek near Wolf Creek, May	Possible disease or pathogens
Overwhich Creek, tributary to West Fork Bitterroot River, June	Suspended sediment
1993	
Missouri River, below Hauser Dam, February	Unknown cause
Tongue River, near Birney, May	Temperature shock from dam release

*As reported to the Montana Department Fish, Wildlife and Parks during 1992 and 1993.

The maximum acceptable increased risk of cancer caused by exposure to arsenic has been identified as one case per one million people for Montana waters. Unlike many other carcinogen risk estimates, studies of human population response to ingesting a wide range of drinking water arsenic concentrations[6,7] were used as a basis for the adopted Montana human health standard of 0.018µg/L total recoverable arsenic. The US EPA drinking water standard is 50µg/L arsenic[8].

Table 10
Assessed Waterbody Size Affected by Toxics

Waterbody Type	Size Assessed for Toxics	Size with Elevated Levels of Toxics
Streams (miles)	7,660	4,923
Lakes (acres)	374,514	321,524

The present detection limit for the atomic absorption, spectrophotometric, gaseous hydride method of arsenic analysis is 1µg/L. Therefore, the human health standard for arsenic is exceeded and its drinking water use is impaired when arsenic has been detected in a waterbody.

[6]Tseng, W.P., 1977, Effects and dose-response relationships of skin cancer and Blackfoot disease with arsenic. Environ. Health Perspect. 19:109-119.

[7]Tseng, W.P., H.M. Chu, S.W. How, J.M. Fong, C.S. Lin, S. Len, 1968, Prevalence of skin cancer in an endemic area of chronic arsenicism in Taiwan. J. Natl. Cancer Inst. 40(3):453-463.

[8]U.S. Environmental Protection Agency, 1986, National primary drinking water regulations, 40 C.F.R. Part 141, July 1, 1986 edition.

Persistent drought conditions, which have plagued Montana, may have aggravated the arsenic problems. Precipitation which may have been capable of diluting the arsenic, has been too low to maintain flows in uncontaminated tributaries. And agricultural irrigation usage further diminishes already low in-stream flows, thereby concentrating arsenic through evapotranspiration losses.

Arsenic and heavy metals on the priority pollutant list, which are associated with metals mining and processing, have been the most commonly analyzed toxics. Water samples are analyzed for organic pollutants when those chemicals are suspected to be present. (Please refer to the Department Circular WQB-7 if more information is needed regarding toxics and carcinogen criteria.)

Water Quality Trend Analysis

Rather than establish a statewide water quality trend monitoring network which would be expensive to maintain and require a long-term funding commitment, DHES\WQD has concentrated its fixed station monitoring efforts on the Clark Fork River Basin, including Flathead Lake. The intensive monitoring of the Clark Fork and Flathead Basins has produced reliable baseline information about the watersheds and will be used to evaluate future watershed management programs.

Analysis of the data from the Clark Fork River Basin indicates that copper concentrations in the headwaters reaches are trending downward. The slow process of mine tailings removal and stabilization may be reducing the copper concentration in the river. Further improvements, although slow, are expected as Superfund-related activities progress in the basin.

As metals have been removed from the upper Clark Fork, however, algae problems in the river have become worse. DHES first began receiving complaints of excess algae growth in the early 1970s, soon after major pollution controls were implemented by the Anaconda Company.

More recently, in the middle reaches of the Clark Fork River, total and soluble phosphorus have shown a downward trend. Phosphorus detergent bans and improved industrial waste treatment appear to be reducing the phosphorus load of the middle Clark Fork River. Implementation of the nutrient TMDL under development is expected to further reduce the soluble nutrient load in the river and reduce or eliminate the present nuisance algae and dissolved oxygen problems.

Flathead Lake monitoring has shown an increase in primary productivity and dissolved phosphorus concentrations. A phosphorus detergent ban and improvements at all of the municipal wastewater treatment plants in the basin have not been able to offset phosphorus increases from population growth and other sources. DHES\WQD and CS&K Tribes are developing a cooperative TMDL to prevent further eutrophication of Flathead Lake and possibly reduce productivity to levels observed in the early to mid 1980s.

The USGS has been actively collecting water quality information from 16 sites spread across the state as part of its national water quality monitoring network. A report prepared by the USGS titled *National Water Summary 1990-91--Stream Water Quality: MONTANA*[9] describes trend analysis for the period 1980-89 for seven key parameters (dissolved oxygen, sulfate, nitrite+nitrate, solids, fecal coliform bacteria, total phosphorus and suspended sediment). At most stations no trends were observed, but when a trend was observed (at one station for total phosphorus, dissolved oxygen, sulfate, nitrite+nitrate and solids; two stations for fecal coliform bacteria) it was downward, i.e., water quality improved.

The lack of widespread trends indicates that no large-scale changes have occurred during the study period. Or, because most of the monitoring stations were on larger streams any improvements that may have occurred in the smaller tributary drainages were masked by unimproved drainages.

DHES\WQD will continue to rely on the USGS for long-term water quality monitoring and trend analysis because Montana does not have the resources to add to the USGS network or develop its own.

---

[9] Knapton, J.R., L.L. Bahls, 1993, Montana Stream Water Quality In R.W. Paulson, E.B. Chase, J.S. Williams, D.W. Moody, compilers, National Water Summary 1990-91 Hydrologic Stream Water Quality, USGS Water-Supply Paper 2400, pp. 361-370.

Lakes Water Quality Assessment

Summary Statistics

Total Size

Montana, including the seven Indian Reservations within the state's boundaries, has 7,004 perennial lakes, reservoirs and ponds that are larger than five acres in size. All are presumed to have public access. Combined, they cover 833,964 acres and are considered to be "significant publicly owned lakes" for the purpose of reporting under Section 314 of the federal Clean Water Act. The term "lake" as used in this chapter means "significant public lakes" as described above.

Lakes Assessed

A total of 183 lakes, covering nearly 800,000 acres, have been assessed for their support of various uses (Table 11). Assessed lakes are those for which the state has made use support decisions based on actual information. Use support decisions have yet to be made for a number of lakes for which water quality information is available. Assessed lakes, including all of Montana's largest lakes and reservoirs, comprise only 3% of all lakes but 96% of all lake acres in the state.

Table 11
Assessed Lakes in Montana by Assessment Category

Unit	Assessment Category		Total	
	Evaluated	Monitored	Assessed	Not Assessed
Number of Lakes	148	35	183	6,821
Acres of Lakes	107,061	691,523	798,583	35,381

Total Lakes in Montana = 7,004 Lakes
Total Lake Acres in Montana = 833,964 Acres

Lakes Evaluated

A total of 148 lakes accounting for 135 of Montana's lake acres have been evaluated (Table 11). Evaluated lakes are those with information other than current water quality data. For evaluated lakes, use support may be based on land use data, reservoir operations, location of sources, and other information.

Lakes Monitored

Thirty-five lakes, accounting for 875 of Montana's lake acres, are being monitored (Table 11). Monitored lakes are those with current data on water quality conditions. Lake monitoring in Montana is supported by EPA grants and conducted by WQD, the Flathead Lake Biological Station (UM) and volunteer monitors. Volunteers are trained and coordinated by the Flathead Basin Commission, the Canyon Ferry Limnological Institute, and the Department of Fish, Wildlife and Parks.

Use Support

The ability of Montana lakes to support aquatic life, swimming, and drinking water uses is summarized in Table 12. Assessment of use support is based on a

Table 12
Summary of Aquatic Life, Swimming and Drinking Water Use Support

Use	Lake Acres			
	Supporting	Partially Supporting	Not Supporting	Support Unknown
Aquatic Life	113,964	683,226	0	36,774
Swimming	457,556	337,228	3,800	35,380
Drinking Water	463,563	18,195	315,428	36,778

comparison of lake information with Montana Surface Water Quality Standards.

Only 14% of Montana's lake acres fully support fish and aquatic life. That is because reservoirs, which comprise most of Montana's lake acres, have inherent problems, due largely to water level fluctuations, that make them less than ideal habitats for fish and aquatic life.

Well over half of Montana's lake acres support swimming. Support of swimming depends on the levels of nutrient enrichment, algal growth, and bacterial contamination.

Thirty-eight percent of Montana's lake acres do not support drinking water use. That nonsupport is due largely to naturally elevated levels of arsenic in the large mainstem reservoirs of the Madison and Missouri Rivers. The arsenic originates in the geysers and hot springs of Yellowstone National Park.

Support of uses is unknown for the 4% of Montana's lake acres that remain unassessed.

Sources of Impairment

Agriculture is the leading source of impairment to Montana lakes (Table 13). Other leading sources of impairment, in decreasing order of importance, are:

1. Natural sources (including arsenic in the Madison and Missouri River reservoirs)
2. Dam operations
3. Municipal sewage plants
4. Air pollution (The leading source of phosphorus in Flathead Lake is atmospheric deposition--i.e., dust and smoke.)

Table 13
Acres of Lakes Not Fully Supporting Uses by Various Source Categories and Degrees of Impairment

Source	Major Impact	Moderate/Minor Impact
Municipal Sewage Plants	0	132,959
Domestic Wastewater Lagoons	0	970
Agriculture	12,900	348,488
Forest Practices	0	34,332
Highways/Roads/Bridges	0	4,520
Land Development	0	10,468
Mining	0	1,600
Septic Tanks	0	9,077
Dam Construction	0	59,649
Dam Operations	0	270,779
Air Pollution	0	126,007
Contaminated Sediments	0	1,520
Natural	24,949	313,664

Point sources of pollution (sewage plants and lagoons) contribute to less than full support of 133,929 lake acres in Montana. Nonpoint sources of pollution (the remaining sources in Table 13), contribute to less than full support of 549,297 lake acres.

Causes of Impairment

Algae-stimulating nutrients (i.e., phosphorus and nitrogen) are the leading causes of impairment in Montana lakes (Table 14). Nitrogen and phosphorus originate from polluted runoff, laundry detergents, sewage, septic tanks, and other sources. Excess nutrients lead to the growth of nuisance aquatic plants, reduced water clarity, and dissolved oxygen deficits. Nutrients impair more than half of Montana's lake acres.

Other leading causes of lake impairment, in decreasing order of importance, are:

1. Water level fluctuations in reservoirs due to dam operations
2. Metals (natural arsenic in Madison and Missouri River reservoirs)
3. Suspended solids (silt)
4. Nuisance aquatic plants (algae)
5. Organic enrichment.

Table 14
Acres of Lakes Not Fully Supporting Uses by Cause Categories & Degrees of Impairment

Cause	Major Impact	Moderate/Minor Impact
Metals	19,349	302,175
Other Inorganics	0	3,996
Nutrients	0	446,111
pH	5,600	0
Siltation	0	72,737
Organic Enrichment	0	259,353
Salinity	12,900	13,875
Thermal	0	25,918
Lake Level Fluctuations	0	346,390
Habitat Alterations	0	5,549
Pathogens	0	13,312
Suspended Solids	0	310,530

Clean Lakes Program

Each state that receives Clean Lakes Program grants from EPA under §314 of the federal Clean Water Act is required to submit a biennial assessment of lake water quality and provide other information on lake protection as part of its §305(b) report. Montana's Clean Lakes Program consists of:

- diagnostic and feasibility studies on Swan Lake and Flathead Lake
- Statewide lake assessments using volunteer monitors
- A survey of fish contaminants in 20 popular fishing lakes
- Development of lake biocriteria

Background

Clean Lakes Program funding is available for work only on "significant publicly owned lakes, reservoirs, and ponds." Montana defines "significant publicly owned lakes" as perennial lakes, reservoirs, and ponds that are larger than five acres. The term "lake," as used here, refers to those waterbodies.

Figure 8
Number of Perennial Lakes
by Size Category

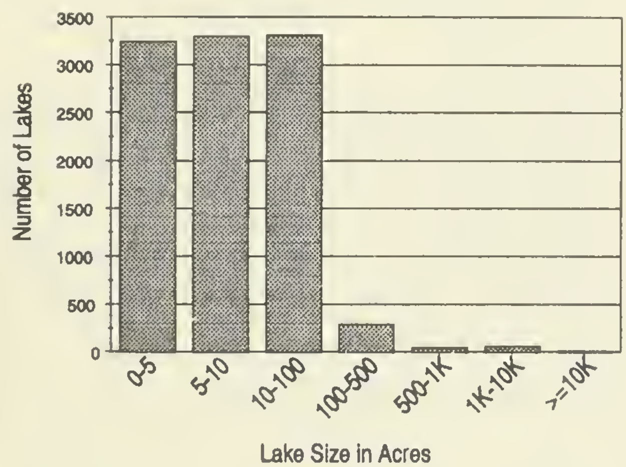
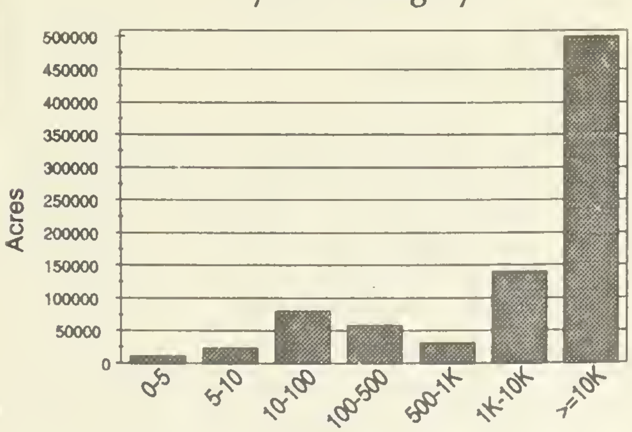


Figure 9
Acres of Perennial Lakes
by Size Category



There are an estimated 7,004 lakes in Montana, including lakes on seven Indian Reservations within the state's boundaries, that meet the above definition. Those lakes cover a total of 833,964 acres. It is presumed that all have public access. The numbers and acres of lakes in Montana by size category are given in Figures 8 and 9. As the figures indicate, well over half of Montana's lake acres are represented by a small handful of very large lakes and reservoirs, including Fort Peck, Flathead, and Canyon Ferry. Although there are more than 3,000 bodies of water in the less-than-five-acre category, together they account for only about 10,000 acres. Most of the small waterbodies are thought to be private stock ponds in eastern Montana.

Trophic Status

Trophic status relates to the degree of nutrient enrichment of a lake and its ability to produce algae. Although Montana has subjectively determined the trophic status of about 1,500 lakes in the past [see 1988 Montana 305(b) report], the WQD has abandoned subjective assessments in favor of the objective and more reliable Carlson trophic state index[10].

Carlson's index is based on summertime measurements of Secchi depth, total phosphorus, and chlorophyll *a* in surface waters following standard collection and analytical methods. Trophic status is based on the average of the Carlson index values computed for the three variables. An average index value of 35 is used as the transition value between oligotrophic and mesotrophic lakes; an average value of 50 is considered the transition between mesotrophic and eutrophic lakes.

The WQD has determined trophic status for 177 lakes covering 797,184 acres (Figure 10 on Page 29 and Table 15 below). These "assessed" lakes

[10]Carlson, R.E., 1977. A trophic state index for lakes. Limnology and Oceanography, vol. 22, no. 2, pp. 361-369.

Table 15
Trophic Status of Significant Publicly Owned Lakes in Montana

Status	Number of Lakes	Acres of Lakes
Total	7,004	833,964
Assessed	177	797,184
Oligotrophic	49	289,569
Mesotrophic	71	425,599
Eutrophic	46	81,495
Hypereutrophic	1	500
Dystrophic	46	22
Unknown	6,827	36,780

are lakes for which the state has made trophic status decisions based on actual data. Trophic status determinations have yet to be made for a number of lakes for which trophic status data are available. Assessed lakes, including all of Montana's largest lakes and reservoirs, comprise only 3% of all lakes but 96% of all lake acres in the state.

Most of the lakes and lake acres assessed so far have been classified as mesotrophic. Mesotrophic lakes, like Fort Peck Reservoir, have moderate levels of nutrients, produce moderate growths of algae, and have water clarity intermediate between the crystal clear waters of oligotrophic lakes and the "pea soup" often displayed by eutrophic and hypereutrophic lakes.

Oligotrophic lakes comprise the next largest group. Oligotrophic lakes, like Flathead Lake, are nutrient poor, produce small amounts of algae, and have very clear water. Algae blooms, if they occur, are infrequent and of light intensity. However, these lakes are very sensitive to inputs of nitrogen and phosphorus from sewage, polluted runoff, air pollution, and other sources. Eutrophic and hypereutrophic lakes are in the minority in Montana. Eutrophic lakes, like Canyon Ferry Reservoir, have abundant nutrients and often produce thick blooms of algae. They may also have low levels of dissolved oxygen and produce unwanted rough fish (carp, for example). Some mesotrophic lakes and most eutrophic lakes are capable of producing blooms of bluegreen algae that are toxic to people, pets, livestock, and wildlife.

Control Methods

Since practically all pollution sources in Montana are upstream of a lake, all federal Clean Water Act and state Water Quality Act programs administered by the WQD control sources of lake pollution to one degree or another. Programs include:

- Monitoring, Assessment and Planning
- Clean Lakes
- Montana Pollution Discharge Elimination System discharge permits
- Stormwater
- Pollution Prevention
- Pretreatment
- Groundwater
- Construction Grants
- Nonpoint Source/Wetlands
- Water Pollution Control (nondegradation, standards, and mining compliance)

Montana Surface Water Quality Standards apply to lakes and streams (see Classification System, Page 11). The Montana Sanitation in Subdivisions Act also provides significant protection to lakes by controlling the release of septic leachates.

Some tribal, county and city ordinances have been passed and are being enforced to protect lakes in Montana. Included are the lake-shore protection ordinances of Missoula and Flathead Counties and the Confederated Salish and Kootenai Tribes. Phosphate detergent bans have been implemented by Lake and Flathead Counties (primarily to protect Flathead Lake) and by several towns along the Clark Fork River (to protect the river and Lake Pend Oreille in Idaho). Nutrient TMDLs (total maximum daily loads) have also been initiated for Flathead Lake (jointly with Confederated Salish and Kootenai Tribes) and the Clark Fork River.

Flathead Lake, at 126,000 acres, is the largest natural freshwater lake in the West and among the cleanest of the world's major lakes. It is also a mainstay of the economy of northwest Montana. In 1984, the Water Quality Division prepared a "Strategy for Limiting Phosphorus in Flathead Lake," which set in motion several initiatives to protect the lake.

In addition to county lake-shore protection ordinances and phosphate detergent bans, Flathead Lake has benefited from many activities sponsored by the Flathead Basin Commission (FBC). Three of the most significant are the Volunteer Monitoring Project, a public information/education campaign, and the Forest Practices/Water Quality and Fisheries Cooperative Program. Recently, the FBC has been participating in a Flathead County planning effort and investigating the benefits of reducing shoreline erosion by stabilizing lake levels modified by Kerr Dam at the lake's outlet. Flathead Lake also benefited from a reference to the International Joint Commission (IJC) regarding a proposed coal mine in British Columbia. The IJC recommended against coal mining and for establishing a zone of cooperation between the U.S. and Canada in the north fork watershed. The Flathead Basin is the only drainage in Montana where advanced treatment (nutrient removal) is required of all municipal wastewater discharges.

Restoration and Rehabilitation Efforts

With an abundance of pristine and near-pristine lakes, the State of Montana emphasizes lake protection over lake restoration in its Clean Lakes Program. Pollution control efforts employed to protect Montana lakes are outlined above.

The WQD cooperates with several other jurisdictions to protect lakes. The agency is represented on the Clark Fork/Pend Oreille Tri-State Implementation Council and the FBCC.

Table 16
Montana Clean Lakes Program Projects

Project Name	Type of Project	Federal Funding (through 4/94)	Problems Addressed
Flathead Lake	Phase I	$70,000	Algae Blooms Hypolimnetic D.O. Deficits
Swan Lake	Phase I	$80,000	D.O. Deficits
Volunteer Monitoring	LWQA	$20,000	Limited Lake Database
Biocriteria Development	LWQA	$ 6,000	Limited Lake Assessment Techniques
Fish Contamination	LWQA	$54,000	Potential Fish Contamination by PCBs and Mercury

The Water Quality Division is cooperating with the Confederated Salish and Kootenai Tribes in developing a nutrient TMDL for Flathead Lake. MDHES also shares lake information with the Blackfeet Nation, which has its own Section 314 Clean Lakes Program. WQD also works on lake protection with private, non-profit groups, including the Flathead Lakers and the Canyon Ferry Limnological Institute.

Montana's Clean Lakes Program is summarized in Table 16. The Swan Lake Phase I (diagnostic and feasibility) study is in progress, so no management measures have been proposed or undertaken. It will be completed in March of 1995. A final Flathead Phase I report, completed in April 1994, includes recommended management measures. However, WQD will request a continuation grant for the Flathead Phase I study in state fiscal year (SFY) 1996. Completion of the Flathead Phase I study and development of the joint Montana Department of Health and Environmental Sciences/Confederated Salish and Kootenai Tribes TMDL for Flathead Lake will be closely coordinated. Volunteer monitoring and biocriteria development projects will continue into SFY 1995. The fish contamination project has been completed and findings are being reviewed by the MDHES Health Services Division.

Acid Effects on Lakes

Since 1991, the U.S. Forest Service (USFS) has sampled 200 high-elevation wilderness lakes in Montana to assess their sensitivity to airborne contaminants. The Wilderness Lake Survey has been conducted out of USFS Region One in Missoula under the Air Resource Management Program. The principal measure employed in this survey is acid-neutralizing capacity (ANC), although field pH and other parameters are also measured. The 200 lakes sampled to date cover about 1,000 acres.

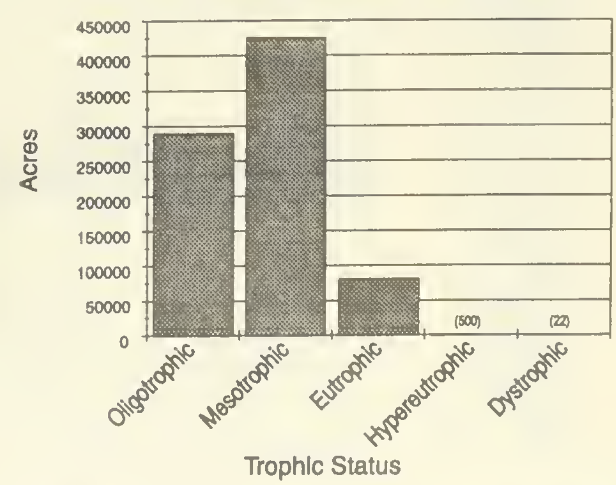
The Montana pH standard for National Park Wilderness and primitive waters (Class A-1) waters is as follows:

"Induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside this range must be maintained without change. Natural pH above must be maintained above 7.0."

The Forest Service considers a 10% change in pH within a natural range of 6.0 to 7.0 to be permissible; no change should be allowed when the natural pH is less than 6.0.

Although a number of lakes in the Wilderness Lake Survey had pH values less than 7.0, most of those that did were believed to be naturally acidic and poorly buffered. Only one lake, Goose Lake on the Gallatin National Forest near Cooke City, had a pH less than 6.0. Goose Lake, which is about 75 acres in size, is believed to be the only lake in Montana in which an acid condition has been made worse by human activities. The source of the acidity is residual mine tailings and adit discharges. There are no plans for restoration or mitigation at this site.

Figure 10
Lake Trophic Status Disribution



Toxic Effects on Lakes

Toxic effects on lakes in Montana are summarized in Table 17. Seven mainstem reservoirs along the Madison and Missouri Rivers (i.e., from Hebgen Lake to Fort Peck Reservoir) exceed the drinking water MCL (maximum contaminant level) or Human Health Standard for arsenic. The natural source of this arsenic is Yellowstone National Park.

Table 17
Toxic Effects on Lakes

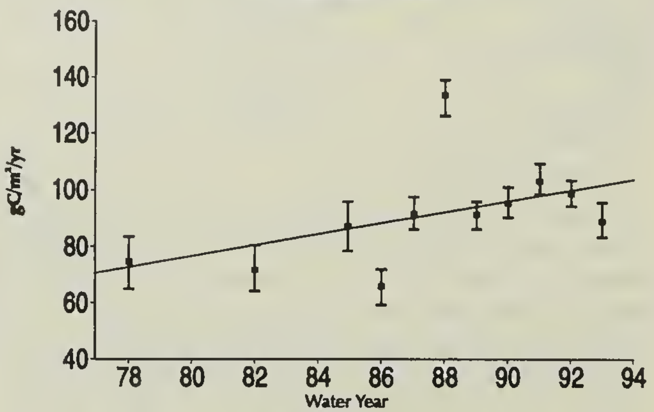
Cause	Source	Number of Lakes	Acres of Lakes
Arsenic	Natural	4	306,529
Selenium	Agriculture	4	13,395
Metals	Mining	4	1,600
TOTALS		12	321,524

Selenium and other trace elements exceed water quality standards in four artificial impoundments. Agriculture is the source of that problem. Mining is the cause of elevated heavy metals in Lake Helena at the mouth of Prickly Pear Creek.

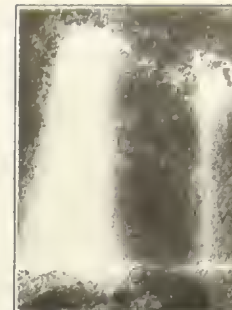
Trends in Lake Water Quality

Flathead Lake (126,000 acres) is the only Montana lake for which long-term trend data are available. Mean annual primary productivity at a site near the midpoint of the lake has been increasing since 1978 (Figure 11). Although Flathead Lake remains oligotrophic in trophic status, this increase represents an accelerated rate of eutrophication and a degrading trend. Other evidence of declining water quality in Flathead Lake are heavier periphyton growths along the shoreline and development of seasonal hypolimnetic oxygen deficits in the Ross Deep area of Big Arm Bay.

Figure 11
Mean Annual Pelagic Primary Productivity of Flathead Lake



Mean annual pelagic primary productivity for Flathead Lake over the period of record at the midlake site. Bars represent minimum and maximum yearly estimates.



The Montana Department of Health and Environmental Sciences (MDHES), Water Quality Division, has received a U.S. EPA grant for more than $433,000 to fund a statewide, interagency wetlands program that will include six components. The division will administer the program and will take the lead in the first two components described below. The remaining components will be undertaken by other state agencies under contract with MDHES. The program components are as follow:

Component 1

The Water Quality Division filled a half-time position on January 1, 1994, (wetlands coordinator) to accomplish the following:

- lead the collection of wetland information and data from all state and federal agencies
- assist in the development of a wetlands database
- develop and execute a Memorandum of Understanding or Policy Statement between the agencies and other key interest groups
- establish a Wetlands Council or work group consisting of at least one member from each key agency and interest group
- develop and initiate a state wetlands conservation/protection strategy that will coordinate and complement the activities of all the agencies and groups.

To date, the wetlands coordinator has directed his efforts to reviewing existing wetlands information and collecting more current data for inclusion in the wetland database. Numerous key contacts have been made with various agencies and interest groups, including the Montana Audubon Council, U.S. Corps of Engineers, U.S. Fish and Wildlife Service, Montana Department of Transportation, Montana Department of Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, U.S. Environmental Protection Agency, and Montana Department of State Lands.

In addition to these contacts, the wetlands coordinator attended and/or spoke at the following events:

- Partners for Wildlife meeting, Great Falls
- American Fisheries Society meeting, Billings
- Interagency Wetland Group meeting, Helena
- Tribal/State/EPA Nonpoint Source workshop, Great Falls
- American Soil Conservation Society meeting, Lewistown
- American Wildlife Society meeting, Kalispell
- Wetland Conflict Resolution workshop, Polson

Component 2

This component is designed to establish baseline water quality and biological conditions in a representative sample of least-impaired wetlands in Montana. This information will be used to develop ecoregion-specific chemical and biological water quality criteria for Montana wetlands and bioassessment techniques that will be used to measure impairment to wetlands that have been exposed to environmental contamination and other stressors.

Table 18 describes the losses of Montana's wetlands, based on information provided by the U.S. Fish & Wildlife Service.[11]

Table 18
Wetland Losses in Montana 1780s to 1980s

Surface Area				
Land Sq. Miles	Water Sq. Miles	1780 Est. % Wetlands	1980 Est. %Wetlands	% of Wetlands Lost
145,556	1,490	1.2% (1,117,870 ac.)	0.9% (838,402 ac.)	27% (279,467 ac.)

Source: U.S. Fish and Wildlife Service

[11] Dahl, T.E., 1990. Wetlands Losses in the United States 1780s to 1980s. U.S. Department of the Interior, Fish and Wildlife Service, Washington D.C., 21 pp.

In addition to wetlands in Montana being lost to agriculture, residential and commercial development and other activities, many of the wetlands that remain have been degraded by human activities.

Montana's Surface Water Quality Standards are currently used to protect wetland water quality. However, specific criteria and waterbody classifications developed for lakes and streams, including designated uses, are often technically incorrect for wetlands.

Component 3

The Department of Natural Resources and Conservation is developing and conducting wetland/riparian workshops throughout the state along with the production of a wetlands newsletter. The Montana Watercourse at Montana State University has held a wetlands education workshop with several educators and nationally known wetlands experts. Based on part of the workshop, a wetlands educational program for adults and grade-school children will be developed.

Component 4

The Conservation Districts Bureau of the Montana Department of Natural Resources and Conservation will organize a "coordinated resources management" effort that will develop solutions to critical water quality/quantity problems in selected watersheds. The bureau will hire a natural resource management professional to coordinate the effort.

Component 5

The Montana Department of Transportation has contracted with a consultant, the Wetlands Training Institute, to perform audits of their existing wetlands delineation/mitigation program. The consultant will also develop a tracking and accounting system for wetland losses/mitigation and banking, along with a monitoring program for complete mitigation sites.

Component 6

The Montana Riparian and Wetland Association is developing a wetland delineation training program and will test the current U.S. Army Corps of Engineers wetland criteria. Other activities involve digitizing Upper Missouri River maps and incorporating Bureau of Land Management land use themes into the final product. Additionally, the statewide document, "Classification and Management of Riparian and Wetland Sites in Montana," is undergoing final edition and review.

Conclusion

The 1994 assessment of Montana wetlands has not changed from the 1992 reporting cycle. The 1992 drought concerns have been reduced throughout much of the state by a period of average to better than average precipitation. However, a virtually unprecedented recent real estate boom in the western and central portions of the state and the building associated with it is cause for increased wetland impact concerns. Hopefully, the implementation of the previously noted wetlands strategy will provide an organizational tool that will allow existing wetland protection and management programs to work better to counter the development threat to wetlands in Montana.

The state's Nonpoint Source Management Plan was initially approved by the EPA in early 1988. It was updated in 1991. The state has concentrated its nonpoint source (NPS) program on three major source categories: agriculture, mining and forestry. Those are among the most prevalent sources of NPS impacts to state waters.

Over the past four years, the state implemented a non-regulatory NPS program with emphasis on watershed/demonstration projects and educational activities. Although a number of groundwater assessment projects have been initiated, the program has emphasized surface water pollution control and protection. Best management practices (BMPs) have been adopted for each of the three primary source categories, and the state continues to refine those as well as to evaluate all other BMPs to ensure their effectiveness in protecting water quality in Montana.

The state NPS program is staffed by six professional resource positions. In addition to the program manager, the five water quality specialists concentrate on watershed project development and agriculture, monitoring, forest practices and water quality assessment, wetlands and mining, and education.

Agriculture

Pollution from agricultural activities is the largest NPS challenge in Montana. Sediment from grazing lands and irrigation return flows cause the majority of the pollution to surface waters. In addition to programs aimed at controlling those challenges, the state program is concentrating funding and staff resources on improvements in animal waste management systems and dry-land salinity control. The Soil Conservation Service agricultural conservation standards and specifications have been adopted as the state's agriculture BMPs. In an effort to continually update BMPs so that they better protect water quality, the BMPs for grazing and animal waste management are both undergoing review. Revisions are expected to be adopted within the year.

Timber Industry

NPS pollution from forest practices is less widespread in the state but can be a serious site-specific problem. Concentrated primarily in the western mountainous region of the state, pollution from forestry has been largely attributed to roads and activities within the riparian area. The timber industry, working closely with both state and federal land management and regulatory agencies, has led the development and implementation of a proactive education program to inform loggers, landowners and others of proper forest best management practices. This education program has been acclaimed as an example of proactive "self-regulation" and is widely thought to be responsible for the failure of proposed legislation that would have implemented a state Forest Practices Act in Montana. Interdisciplinary BMP audits have been conducted for the past several years and have helped pinpoint NPS problems and suggest alternative solutions. The recent passage of the Streamside Management Act stipulating a zone of special management on both sides of a stream, lake or other waterbody has also assisted in the protection of water quality during commercial logging activities.

Mining

NPS pollution from mining activities is commonly associated with inactive mine sites. New mining activities are most often regulated by state and federal permits, and although the regulations have continued to evolve over the past four years, runoff from old tailings and acid mine discharges from abandoned adits continues to impact surface waters in the western part of the state. The implementation of state and federal regulations that require, when possible, "responsible parties" to be designated who must complete reclamation to reduce or eliminate discharges to state waters has moved much of the work into the point source permit program rather than being addressed under the NPS program or the state's abandoned mine reclamation program.

Other

Other source categories being addressed in part by the state NPS program include hydromodification (stream or channel modification), stormwater, and urban. Each of these sources is also regulated by other statutes requiring the acquisition of state or federal permits prior to the initiation of specific activities. For example, stream modifications require a permit from the local conservation district, a permit from the Water Quality Division, and a permit from the Corps of Engineers, and often a permit from the local floodplain administrator. With those regulations in place, the NPS program has been promoting the use of various BMPs that result in the least (or lesser) impact to state waters. This has been accomplished through a variety of educational activities including the use of radio public service announcements (PSAs), billboards and print media such as brochures and guides.

During the past four years, the state has implemented a dozen watershed/demonstration projects (Figure 12 on Page 35), five ground water projects, and 43 educational activities/projects. The typical watershed project is sponsored by a local conservation district, incudes the demonstration of NPS best management practices in a medium-sized watershed (8-30 miles in length), has included 80-90% of the landowners within the watershed and has provided up to 75% cost-share for the BMPs implemented as a financial incentive for cooperation. Monitoring occurs before, during and after implementation of various BMPs and is an integral part of the project -- both to determine the effectiveness of the BMPs and the overall reduction of NPS pollution within the watershed. Additionally, each demonstration project includes an educational element so that lessons learned and the technology employed can be effectively transferred to other areas within the state.

NPS education projects have been carried out by the Water Quality Division, other state agencies, conservation districts, industry groups, and conservation groups. Although the majority of the information/education projects funded by the WQD have targeted agricultural sources, NPS program personnel have also worked closely with the forest industry to produce forestry BPS education products such as BMP brochures and booklets as well as a very popular video. The program also recently produced a placer mining BMP booklet with the assistance of EPA, the Department of State Lands and the Montana Bureau of Mines and Geology.

In addition to the information and education projects aimed at specific source categories, the NPS program has led the effort to inform the public about specific water resource issues and their potential impacts on water quality. For example, during the drought period of 1992, with the assistance of other state agencies, the NPS program produced two 30-second TV PSAs about the impacts of drought and over-consumption on aquatic life and promoting water conservation. One of the spots was awarded an "Addy Award" for excellence in television PSAs.

In several watersheds in the state, watershed groups have formed or are forming to address resource problems, including water quality impairment, on a watershed or ecosystem basis. The state supports watershed management as the most appropriate method to address NPS problems and has already taken steps to begin preparing for expected provisions of the Clean Water Act reauthorization. We are in the process of developing training sessions that will build the capacity of local groups to prepare and implement watershed plans. Watersheds are now being prioritized by the state with priority given to those that have existing planning groups in place. The designated watershed unit will likely follow hydrologic or watershed lines, but size may vary dependent upon the issues and problems identified by local watershed management groups and the potential for solutions. The state expects 30 or more watershed plans to be developed over the next five years. Most will specifically address water quality problems identified in the watershed and propose solutions to those through the use of approved management measures.

Figure 12
Montana Water Quality Division
Nonpoint Source Demonstration Projects

Public water suppliers using surface water were required to address new surface water treatment requirements by June 29, 1993. The new requirements were adopted by EPA in response to the 1986 amendments to the Safe Drinking Water Act. Unfiltered surface water sources were required to be filtered, or to meet stringent watershed protection and water quality requirements. Filtered water supplies had to meet new standards for filtration and disinfection.

A few water suppliers chose to abandon their surface water sources and utilize groundwater. Most suppliers were not able to meet the June 29, 1993 deadline for compliance, but most submitted schedules for compliance in advance of the deadline. Most of the suppliers using unfiltered surface water have received administrative orders which include schedules for compliance. Four suppliers will likely be able to meet the watershed protection and water quality criteria and will therefore avoid filtration (Table 19).

Table 19
Montana Public Water Supplies and Municipalities Served Which Meet Raw Surface Water Quality Standards for Turbidity and Coliform Bacteria Concentrations

Water Supply	Municipality Served
Basin Creek Reservoir	Butte
Fred Burr Lake	Philipsburg
Hellroaring Creek	Polson
Indian Creek	Ronan
Ashley Creek	Thompson Falls (under study)

Most of the suppliers that must install filtration have applied for funding assistance. Some of these water supplies are very small. The installation of filtration could be very expensive for these small systems without funding assistance.

Anaconda and East Glacier were placed under boil orders because of water quality or water treatment problems. The City of Anaconda utilizes surface water without adequate chlorine contact time. East Glacier had turbidity problems because of runoff and also does not have adequate chlorine contact time. Butte-Silver Bow City-County Government has made remarkable progress toward the installation of two new surface water filtration plants. It appears that water delivered to Butte residents will meet treatment standards beginning in 1995. Butte remains under an EPA boil order until then, however.

Outbreaks of *Cryptosporidium* in the United States have created an increased awareness of the risks of using unfiltered surface water for a public water supply. An outbreak in Milwaukee, Wisconsin, left a reported 50 people dead and infected more than 100,000. EPA is now developing new standards for surface water treatment. It is apparent that suppliers using surface water in Montana will have to meet even more stringent standards in the future.

SUMMARY

More than 50% of Montanans get their domestic water supply from groundwater sources. The most important aquifers in Montana are the alluvial aquifers that occupy the river valleys throughout the state. The alluvial aquifers are shallow, unconfined or semiconfined, sand and gravel deposits. The groundwater is plentiful and the water quality is generally excellent. Yet these aquifers are also very vulnerable to pollution from human activities. The challenge for Montana is to protect groundwater quality as more people and businesses move into the river valleys. The Department of Health and Environmental Sciences and the Department of Natural Resources and Conservation are jointly preparing a Comprehensive Groundwater Protection Plan to address protection of both groundwater quality and quantity. The plan is scheduled for completion in December 1994.

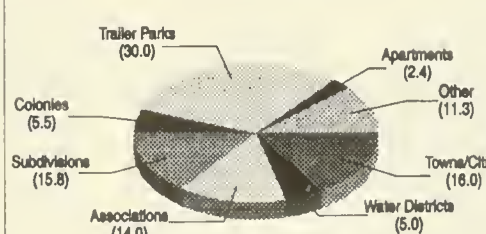
GROUNDWATER ASSESSMENT

Overview

Groundwater Resources. Groundwater in Montana generally has not been degraded by human-caused contamination. The unconsolidated alluvial valley aquifers, which are used by the majority of groundwater systems, are a wholesome and plentiful source of drinking water. Natural substances lower the water quality of many of the consolidated aquifers, making them less desirable as drinking water supplies. Concentrations of dissolved solids commonly exceed the national secondary drinking water standard of 500 milligrams per liter (mg/l), especially in the eastern aquifers. Dissolved solids can range from 400 to 5,000 mg/l.

About 54% of Montana's population uses groundwater for domestic purposes. Of the 1,888 public water supplies, 1,771 rely totally on groundwater. Groundwater provides drinking water for 90 incorporated cities and towns, 31 water districts, 483 unincorporated communities, 146 schools, 73 businesses and hospitals, and 948 restaurants, campgrounds, motels, ski resorts, and highway rest stops.

Figure 13
Montana Community
Public Water Systems



The majority of the public water supplies service small communities in the alluvial valleys and use the alluvial aquifers for their drinking water. The typical community public water supply serves fewer than 100 inhabitants. Figure 13 shows the types of organizations that manage community public water systems (PWS).

Groundwater Management Strategy. In November 1993, the Montana Groundwater Planning Committee began integrating the recommendations of the 1992 Montana Water Plan and the EPA's Comprehensive State Groundwater Protection Program Guidance into a Comprehensive State Groundwater Plan. The committee, selected by the directors of the Department of Health and Environmental Sciences and Department of Natural Resources and Conservation, includes representatives from the state legislature, agencies and boards, as well as environmental, agricultural, business and conservation organizations.

A draft Comprehensive State Groundwater Plan will be available for public review in 1994 and will address both quality and quantity of Montana's groundwater. The goal of the plan is to protect and improve Montana's groundwater resources to sustain current and future uses that are in the public interest. The purpose of the plan is to recommend actions to improve public and private management of Montana's groundwater.

Wellhead Protection Strategy. The Montana Wellhead Protection Program was resubmitted to EPA on May 26, 1993. Approval of the program is expected in 1994.

The implementation goals of the program are:

1. Within two years, the Water Quality Division will delineate zones of contribution for all community public water supply wells serving a population of 1,000 or more residents. This includes 45 communities with a total of 187 wells and 65% of the residents served by public water supplies using groundwater.
2. The Water Quality Division will certify wellhead protection areas for community public water supplies at a projected rate of 10 per year.
3. In addition, the Water Quality Division will target noncommunity PWS operated by large businesses and state and federal agencies. State and federal agencies manage approximately 20% of the 1,167 noncommunity supplies. The 50 large businesses targeted serve populations ranging from 100 to 900 workers.

The Montana Bureau of Mines and Geology plans to complete wellhead protection areas for 14 vulnerable school supplies, provided grant funds are available. Numbers of students attending the large schools range from 100 to 700.

Groundwater Quality

Disposal of individual waste water and storm water into open-bottomed drains (Class V underground injection wells) threatens Montana's groundwater. Organic solvents are flushed into unconfined alluvial aquifers in urban areas via these drains. Public water supply wells in Missoula and Bozeman have been abandoned after being contaminated with solvents. It is impossible to know how many private wells may also be contaminated. The EPA estimates there are about 10,000 storm drains, 400 industrial injection wells and 500 automotive injection wells in Montana. About 150 automotive injection wells have been closed by converting the operations to "dry shops."

Approximately 120,000 individual, on-site septic systems are used by 300,000 people in Montana. Septic system failures are suspected to cause substantial, widespread nutrient and bacterial contamination to groundwater and surface water. Monitoring has shown increased nitrate in groundwater and surface water near areas of concentrated septic systems. Nitrate levels above 10 mg/l cause "blue baby syndrome" which can be fatal to infants. Bacteria can cause several waterborne diseases such as typhoid and gastroenteritis.

As of May 1992, Montana had 22,482 registered underground storage tanks. The majority were installed 10 to 20 years ago on residential, commercial, or farm property. There have been 963 confirmed releases from underground tanks, and new reports come in at a rate of 20 to 30 per month. Half of the releases reached groundwater. Five recorded incidents resulted in benzene (a carcinogen) contamination of public water supplies. The Town of Cascade, for example, was forced to abandon one of its wells.

Montana has eight sites listed on the federal Superfund National Priority List. As of October 1991, there were 236 sites prioritized for remedial action through the Montana Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Unlike the federal Superfund Act, this act also addresses sites that have asbestos or petroleum contamination. Fifty-nine of these sites have documented impacts to groundwater.

Montana currently has approximately 416 registered generators and/or recyclers of hazardous wastes. About 40 hazardous waste transporters are registered with the Waste Management Division. Many smaller businesses handle hazardous materials but are not required to register. There are currently 11 permitted facilities that treat, store, or dispose of hazardous waste.

An average of 300 accidental spills are reported each year to the Hazardous Materials Emergency Response System. About 5% require extensive cleanup and monitoring. In 1991, a tanker truck spilled 1,000 gallons of gasoline 100 feet away from a community water supply well. The well was not contaminated by the spill due to quick response and effective emergency services.

Ten pesticides have been detected in Montana groundwater: atrazine, 2,4-D, dicamba, dinoseb, MCPA, picloram, pentachlorophenol, simazine, bromacil and aldicarb. All the detection levels in public water supply wells were below established health guidance levels except for pentachlorophenol and dinoseb. Pesticides have been detected in three wells that supply water to rural schools. The Montana Agricultural Chemical Groundwater Protection Act directs the Montana Department of Agriculture to develop a general management plan and specific management plans implementing best management practices where pesticides are detected in the groundwater. The statewide general pesticide management plan has been completed, but no specific management plans have been developed.

The Department of State Lands has reported that two-thirds to three-fourths of the mines that have used cyanide to process ore in Montana have had

Table 20 Major Sources of Groundwater Contamination			
Source	Check	Relative Priority	Factors
Animal Feedlots	X	M	7
Deep Injection Wells	X	L	5
De-Icing Salt Storage Piles	X	L	6
Fertilizer Applications	X	M	4
Irrigation Practices (return flow)	X	M	6
Land Application	X	M	4
Landfills (permitted and unpermitted)	X	M	1, 4
Mining and Mine Drainage	X	H	2, 4, 5
Pesticide Applications	X	M	4
Pipelines and Sewerlines	X	M	1, 2
Septic Tanks	X	VH	1, 2, 6, 7
Shallow Injection Wells	X	VH	2, 3, 4, 6
Storage Tanks (above & below ground)	X	H	2, 4, 6
Storm Water Drainage Wells	X	M	2
Surface Impoundments and Lagoons	X	M	1, 2
Transportation of Materials		XM	2, 4
Waste Tailings	X	M	1, 4
Abandoned Water Wells	X	M	1, 2

Legend: **VH** = Very High **H** = High **M** = Medium **L** = Low

Factors for Establishing Relative Priority
1. number of sources
2. location of sources relative to groundwater used as drinking water
3. size of the population at risk from contaminated drinking water
4. risk posed to human health and/or the environment from released substances
5. high to very high priority in localized areas of state, but not over majority of state
6. hydrogeologic sensitivity
7. findings of the state's groundwater protection strategy or other reports
8. other criteria

documented releases. There are about 30 ore processors that use cyanide, 14 of which are inactive. Of the releases, four affected groundwater quality beyond the boundaries of the mine property. Two resulted in the contamination of nearby domestic wells.

The American Petroleum Institute estimated that for 623 wells drilled in 1985, 4.5 million barrels of drilling fluids were produced (an average of 7,330 barrels per well.) This fluid can contain benzene, phenanthrene, barium, fluoride, or antimony, along with high concentrations of calcium, magnesium, and sodium salts. The salts can easily migrate into the groundwater. Cases are documented in eastern Montana where these salts have contaminated domestic water supplies.

Municipal solid waste landfills are a source of groundwater contamination in Montana. Twenty-five years ago there were about 500 landfills in the state. In 1987, there were 140 operating and only a dozen had begun groundwater monitoring. Many small landfills are closing. MDHES estimates there eventually will be only 50 to 75 regional landfills operating in the state.

Table 20 summarizes and ranks the major sources of groundwater contamination. Table 21 summarizes and ranks the substances contaminating groundwater.

Groundwater Indicators

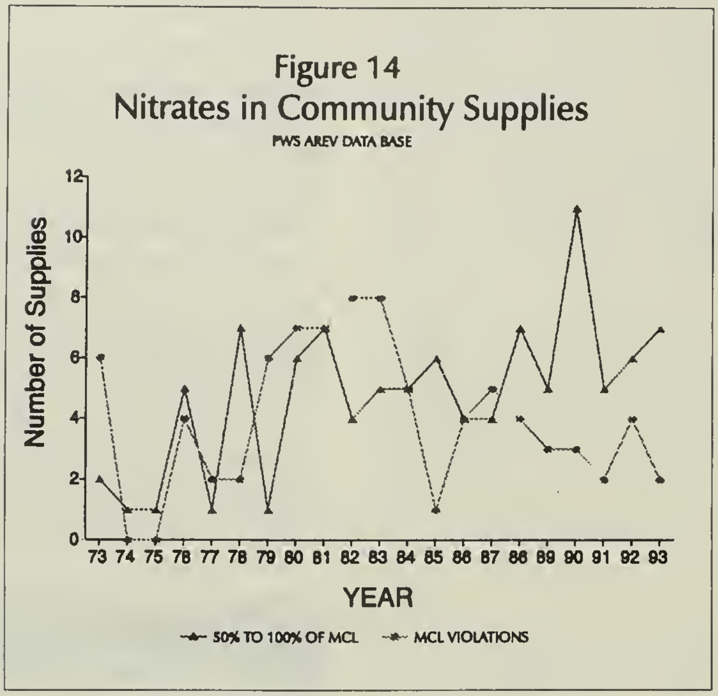
About 45 wellhead protection areas presently have all the elements of wellhead protection except contingency planning. Certification of the wellhead protection areas is anticipated between October 1993 and September 1995. In addition, 175 wellhead protection areas have at least one element completed. To date, interest in beginning wellhead protection for 140 wellheads and springs has been expressed to the Water Quality Division.

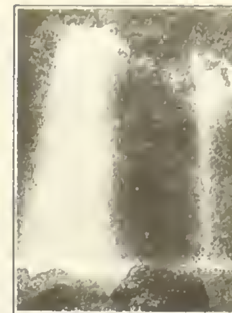
Table 21 Groundwater Contaminants			
Organic Contaminants		Inorganic Contaminants	
Pesticides	X	Pesticides	
Petroleum compounds	X	Nitrate	X
Other organic chemicals:		Fluorides	
Volatile	X	Brine/Salinity	X
Semi-volatile		Metals	
Miscellaneous		Arsenic	X
		Other metals	X
Microbial Contaminants		Radionuclides	
Bacteria	X	Other	

Two studies have been conducted into levels of nitrates and pesticide residues in Montana well water. The nitrate study concluded that nitrate concentration in groundwater is more closely related to geologic, soil, and climatic conditions and cropping practices than to fertilizer use or waste disposal practices. The pesticide residue study indicated the relatively fast groundwater movement found in most shallow aquifers in Montana restricts the ability to detect measurable quantities of these substances unless the sampling schedule closely follows application schedules. Given those conclusions, nitrate and pesticide indicators do not adequately describe groundwater trends in Montana.

Nearly all of Montana's public water supplies using groundwater are free of health-threatening contamination. In 1993, 10 community groundwater supplies were placed under a boil order for contamination with fecal coliform bacteria (2% of

the community groundwater systems). One reported a nitrate violation. Prior to 1993, there were six reported organic chemical violations (0.3% of all groundwater systems). Figure 14 shows the number of community public water supplies with MCL violations for nitrates and those between 50 and 100 percent of the MCL for nitrates.





Introduction

The federal Clean Water Act (CWA) §303(d) and the EPA Water Quality Planning and Management Regulations (40 CFR, Part 130) require each state to:

1. identify waterbodies that are water quality limited
2. prioritize and target those waterbodies
3. determine the Total Maximum Daily Load (TMDL) allowable to meet water quality standards.

The process of determining the Total Maximum Daily Load for each waterbody provides the basis for systematically achieving water quality standards. It is an approach that accounts for nonpoint and point sources of pollution and background levels in a watershed.

A Total Maximum Daily Load is the total maximum load (mass unit per day) of a water quality parameter (e.g., phosphorus, sediment, copper, etc.) that a waterbody can assimilate and not violate water quality standards. A TMDL consists of three general components: ***waste load allocations*** (WLAs) for the point sources of pollution, ***load allocations*** (LAs) for the nonpoint sources of pollution, and a ***margin of safety*** (MOS) which incorporates the uncertainty in making the other allocations. All sources of a parameter are either explicitly assigned an allocation or implicitly included in a general allocation or MOS.

A symbolic representation of the TMDL is:

$$TMDL = \Sigma(WLA) + \Sigma(LA) + MOS.$$

One of two general approaches may be used to develop a TMDL, depending on the amount of data available (Figure 15 on Page 44).

Approach One

With abundant data (left side of Figure 15 on Page 44), a TMDL may be calculated and the appropriate WLA, LA and MOS assigned. The modeling techniques used may be simple or complex. After EPA approval and application of the necessary controls, a follow-up monitoring program would be developed to ensure that water quality standards are met.

Approach Two

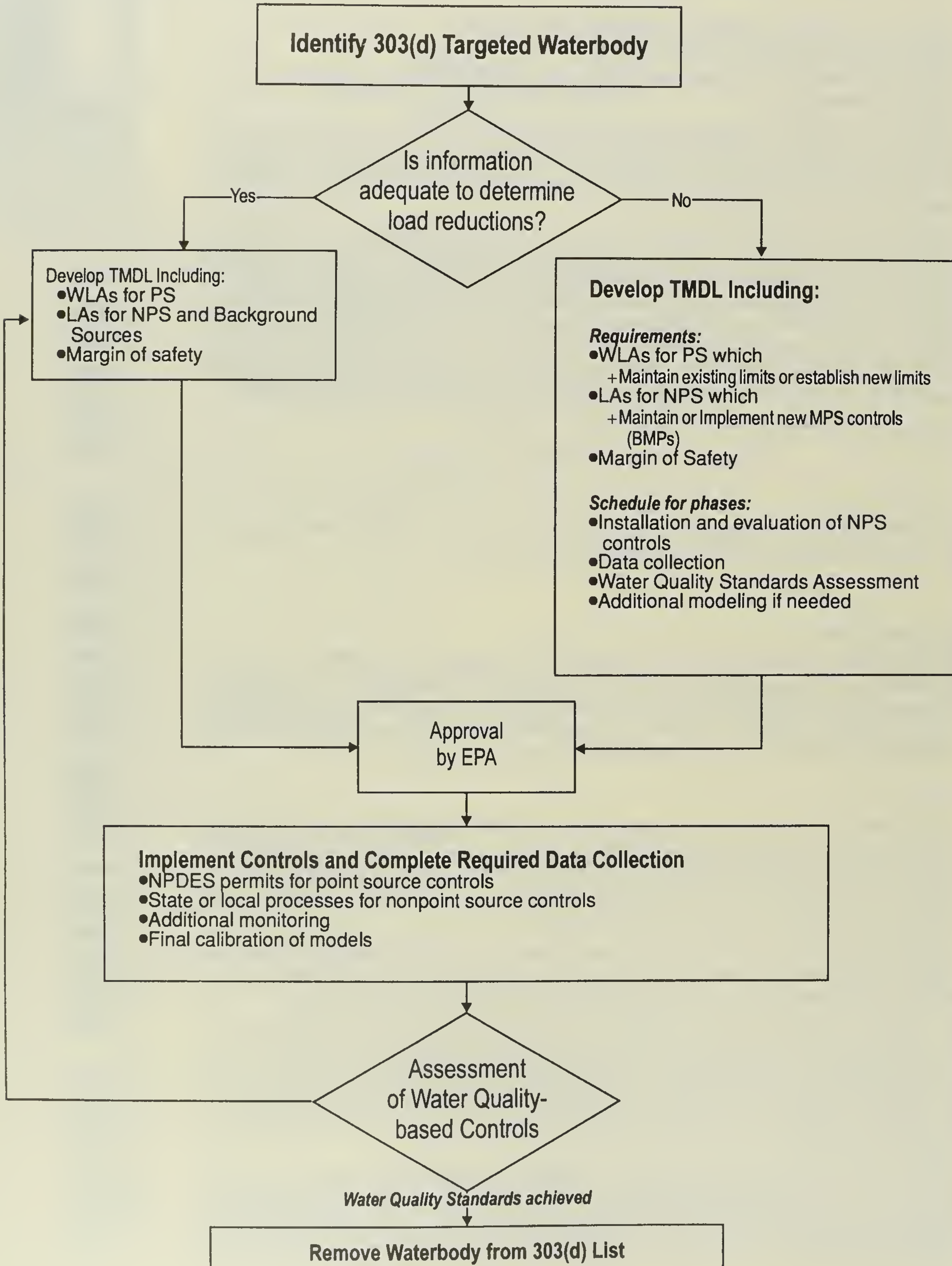
A more common scenario for establishing a TMDL, especially when nonpoint sources are present, is the phased approach (right side of Figure 15 on Page 44). Available data are used in the first go-around of WLA, LA and MOS determinations. The MOS is often large, reflecting the lack of information or the uncertainty associated with the models used.

In the next phase(s), additional monitoring data and Best Management Practice (BMP) evaluations are used to develop a management and control plan, refine modeling components and revise the WLA, LA and MOS as necessary.

The "final" control strategy and TMDL need EPA approval before implementation. Follow-up monitoring of the waterbody is a major component in this process and is necessary to determine the effectiveness of the proposed WLAs on the permitted sources and the BMPs applied to the nonpoint sources. The monitoring program results are evaluated and adjustments to the "final" TMDL are made as necessary.

Throughout each of the approaches, the public and the EPA are involved. Public input can be in the form of suggested waterbody listing, priority establishment, or comments about the WLAs and LAs used to establish the Total Maximum Daily Load. The EPA provides oversight and final approval of the §303(d) list and TMDL plans.

Figure 15
Development of TMDLs for Targeted Waterbodies



Background

The waterbodies listed in Appendix A are "water quality limited" and in need of Total Maximum Daily Load development. A quality limited waterbody does not meet water quality standards (numeric or descriptive) after application of required technology-based controls for point sources, regardless of whether BMPs have been applied for non-point sources.

Table 22 Waterbodies Designated as High Priority for TMDL Development	
Clark Fork River *# (Warm Springs Creek to the Flathead River)	MT76G001-00 and MT76M001-00
Silver Bow Creek * (above Warm Springs Ponds)	MT76G003-02
Silver Bow Creek * (below Warm Springs Ponds)	MT76G003-01
Mill-Willow Bypass *	MT76G004-12
Warm Springs Creek *	MT76G004-23
Flathead Lake*#	MT76LJ006-01
Swan Lake*	MT76K002-01
Daisy Creek	MT43C001-14
Fisher Creek	MT43D002-11
Soda Butte Creek	MT43B002-03

* indicates carried over from the 1992 list

# indicates waterbodies targeted for TMDL development during the 1994-1995 biennium

Table 23 Waterbodies Designated as Moderate Priority for TMDL Development During the 1994-1995 Biennium	
Godfrey Creek	MT41H002-02
Big Otter Creek	MT41Q004-05
Butcher Creek	MT43C001-08
Otter Creek	MT43B004-1
Big Spring Creek	MT41S004-1,2
East Spring Creek	MT76LJ010-02
Musselshell River	MT40A001-1
Ninemile Creek	MT76H002-25
Threemile Creek	MT41D004-29
Elkhorn Creek	MT41D004-05
Blackfoot River	MT76F001-1,2,3
Nevada Lake *	MT76F003-02
Nevada Creek *	MT76F002-08
Rock Creek *	MT76N003-19
Libby Creek *	MT76D002-06
Stillwater River *	MT43C001-11,12
East Boulder River *	MT43BJ001-02
Whitefish Lake *	MT76L001-01

* indicates carried over from the 1992 list

Technology-based controls refer to the control processes and methodologies normally applied to point sources of pollution (e.g., industrial discharges or municipal wastewater treatment plants). An example of a technology-based control is the requirement of secondary treatment of domestic waste.

Nonpoint source (NPS) pollution can also cause a waterbody to be water quality limited even though all appropriate BMPs have not been applied. BMPs are standard practices designed to limit nonpoint source pollution when applied to specific land use practices. BMPs and technology-based controls do not take into account the cumulative effects that other sources or background conditions have on water quality.

A waterbody may be water quality limited by one or more parameters (e.g., nutrients and dissolved oxygen). An example of a water quality limited waterbody might read as follows:

> A stream that has received excessive nutrient loading (nitrogen and phosphorus) from several nonpoint sources and also receives the discharge from a municipal wastewater treatment plant, has experienced nuisance algae growth and dissolved oxygen (DO) sags below criteria established for the stream. The treatment plant has a current Montana Pollution Discharge Elimination System (MPDES) permit and several BMPs are in place along the stream corridor.

Such a stream should be on the §303(d) list because it is not meeting descriptive water quality standards for recreation and swimming (nuisance algae growth) and the numeric criteria for dissolved oxygen.

Listing and Prioritization Process

The §303(d) listing process begins with identifying waterbodies (i.e., streams or lakes) that do not fully meet water quality standards or are fully supporting their uses but are threatened. Such streams or lakes are referred to as "water quality limited" and are in need of TMDL development.

The primary database used to compile the list of such waterbodies is the Waterbody System (WBS). The WBS was used to compile use-support information for the Montana Water Quality Report §305(b). Information sources used to make support decisions include the following:

- ◆ Clean Water Act §208 monitoring (Montana Statewide Water Quality Management Planning project)

- Clean Water Act §319 monitoring and assessments (Nonpoint Source Pollution Control Program)
- Clean Water Act §314 monitoring (Clean Lakes Program)
- Waterbody assessments
- Fixed station monitoring
- Intensive surveys
- Special projects
- Data from other agencies
- Tribal monitoring data
- Volunteer monitoring
- Data from STORET (an EPA-supported national water quality database)

As part of the §303(d) listing process, Montana Pollution Discharge Elimination System (MPDES) permits due to be renewed during the 1994-1995 biennium and permit extensions are presented as Appendix B. Even though parts of the MPDES permitting and renewal process may be similar to Total Maximum Daily Load development, they are not included in the prioritization of waterbodies for TMDL development. However, MPDES permit effluent limits may be used as WLAs for a TMDL.

After the waterbodies that are water-quality limited have been identified, they are prioritized and targeted for TMDL development. The prioritization and targeting process is specifically designed to promote input from local organizations (e.g., Conservation Districts or environmental organizations) and industry.

The criteria used to place a waterbody in one of three TMDL development priority categories (high, moderate or low) are:

1. Magnitude of standard non-compliance or whether the waterbody is an important high-quality resource at an early stage of degradation;
2. Resource value;
3. Size of the waterbody not attaining standards;
4. Whether technology and resources are available to correct the problem;
5. Recommendations obtained through the public review process, and,
6. Potential for establishing a Total Maximum Daily Load within two years.

The high-priority waterbodies may be severely out of compliance with standards, may be a human health risk, may have technology and resources available to address the water quality problem with a reasonable certainty in a two-year time frame, may have been nominated though public input, or strong public support may exist for the establishment and implementation of the control measures required by a TMDL.

Moderate-priority waterbodies may be less severely degraded, may have nonpoint source demonstration projects in the watershed, or the process of implementing water quality controls will require more than two years. Moderate priority includes waterbodies where significant development is planned and controls in addition to established technology-based controls may be necessary to meet water quality standards.

Low-priority includes the remaining identified waterbodies. As TMDL projects are completed and other factors change, selected waterbodies in this category may be upgraded to moderate or high priority or targeted for TMDL development.

After the draft §303(d) list has been developed, a 30-day public notice period will follow. Announcement of the list will be published in the state's major newspapers. The EPA must give final approval of the §303(d) list.

The guidelines outlined above were used to list water quality limited waterbodies (Appendix A) and to prioritize those waterbodies for TMDL development (Tables 22 and 23).

Modifications to the 1992-1993 Priority Listing

The waterbodies listed as moderate, high or targeted for TMDL development during 1992-93 and carried over to the 1994-95 reporting period are flagged with a "*" (Tables 22 and 23). Daisy Creek and Fisher Creek, which were listed as moderate-priority, are now listed as high-priority at the recommendation of the Greater Yellowstone Coalition.

The targeted high priority waterbodies (Flathead Lake and the Upper and Middle Clark Fork River) will be carried over into the next biennium. The TMDLs are being actively pursued and draft TMDLs are projected for the 1994-1995 biennium.

The waterbodies that were listed as high-priority during 1992-1993 and had §319 NPS (nonpoint source) demonstration projects associated with them are being changed to moderate-priority. The NPS project activities have been directed at on-the-ground BMP implementation and effectiveness monitoring and education rather than development of load allocations. Several additional years of monitoring will be needed to evaluate BMP effectiveness because of seasonal variability. The moderate-priority category listing will allow testing of control technologies without failing to establish a TMDL in the two-year time frame.

All low-priority waterbodies are carried over into the next biennium.

TMDL Project Update

Flathead Lake

The Flathead Lake TMDL is a cooperative effort involving the Montana Department of Health and Environmental Sciences, Water Quality Division, and the Confederated Salish and Kootenai Tribes (CS&KT) to limit nutrient pollution of Flathead Lake and maintain or improve its quality. The work on the TMDL began in November 1993. The Water Quality Division has received funding through the EPA National TMDL Mini-Grant program for its work on developing the TMDL. Other EPA funding programs are supporting the CS&KT' proposed study of shallow groundwater nutrient loading of the lake. Another EPA grant will allow the Flathead Basin Commission to coordinate the WQD and CS&KT work and to involve the public in TMDL development.

The initial phase of the TMDL development will use data available from previous research by the Flathead Lake Biological Station to develop draft Load Allocations and Waste Load Allocations. Modeling techniques and mass balance calculations will be used to predict the maximum daily load and concentration of phosphorus that will maintain the desired high water quality. The information obtained from the CS&KT groundwater study will refine the initial phase allocations.

Clark Fork River Basin

TMDL development in the Upper and Middle Clark Fork River Basin has consisted of three EPA national "SWAT" team technical assistance grants. The grants have funded short-duration projects (approximately 40 staff hours each) designed to work on small portions of the overall TMDL development process. With completion of the current grant, draft Waste Load Allocations for four major point sources and a Load Allocation for the Bitterroot River will be calculated. The calculation method will indirectly account for NPS (nonpoint source) and background loads and allot a 15% MOS (margin of safety). The water quality database for the Clark Fork River is extensive, but documentation of nonpoint sources is incomplete. Therefore, a nonpoint source control strategy may need to be designed, implemented and monitored because reduction of the point source discharges alone may not meet the TMDL target or be practical.

Watershed Planning and Management

Watershed planning and management are probably the most cost-effective means to improve or protect a water resource. Watershed planning may be for any resource size from a major river basin with numerous ownerships to a small tributary with only a few land owners. Further, watershed planning and management typically considers many resources rather than focusing on a particular resource or use.

The watershed management approach differs from what may be considered more historic methods by identifying resources by hydrologic rather than political boundaries even though several political boundaries (i.e., counties) may be included. This method also acknowledges the fact that activities anywhere in the watershed can have an effect on water quality and that the cumulative effect of several small impacts may impair a waterbody even though individually they may not.

The Montana Water Resources Coordination Committee (WRCC) has endorsed and is actively pursuing interagency/interdisciplinary watershed planning and management in Montana. The WRCC was formed and is currently chaired by the Water Quality Division. The Committee members include state and federal agencies, water user organizations, conservation and environmental organizations and industry representatives. The purpose of the WRCC is to facilitate water resource program coordination throughout the state with all interested and affected parties. The goals of the WRCC will be best met through the use of watershed planning and management principles. All members of the WRCC are becoming actively involved in implementing the watershed approach to most efficiently and effectively improve and protect the state's water resources.

In addition to the watershed projects sponsored by the NPS program, the following discussion describes five other large watershed efforts that are currently under way in the state.

Flathead Lake's Watershed Management Plan

Flathead Basin Commission

Background

Even with a phosphate detergent ban, advanced wastewater treatment at municipal sewage treatment plants, and a heightened awareness of nonpoint source pollution and best management practices, water quality in the Flathead River Basin continues to decline. Much of this decline is associated with development, the rapid influx of new residents, and unabated point and nonpoint sources of pollution. Most control activates in the past have been accomplished in a piecemeal fashion and through the use of regulation alone.

The mission of the Flathead Basin Commission (FBC) is to *protect the existing high quality of the Flathead Lake aquatic environment, the waters that flow into, out of, or are tributary to the lake, and the natural resources and environment of the Flathead Basin.* To help accomplish this mission, the FBC, in cooperation with DNRC, WQD and the CSKT, is proposing to develop and implement a comprehensive lake and watershed management plan. The plan will address water pollution, water conservation, and water management.

The FBC plans to use a collaborative, consensus-based approach whereby local stakeholders are empowered to identify the sources of contaminants, evaluate potential solutions, and encourage appropriate management practices. The plan would dovetail with and build upon the cooperative Flathead Lake Nutrient TMDL between the Tribes and the State of Montana. The Commission intends to monitor and evaluate implementation of the plan.

The FBC will develop and implement the plan with a $100,000 grant from the Water Development and Renewable Resource Development Grant Program, DNRC. The FBC submitted a grant application to DNRC on May 15, 1994.

Location

The proposed management area is the Flathead Lake and River Basin above Kerr Dam near Polson, Montana. The area includes all of Flathead County and the portion of Lake County draining into Flathead Lake. The approximate southern half of the lake is located within the Flathead Reservation of the CSKT. A small portion of the basin extends into British Columbia, Canada.

Problem

Flathead Lake is the largest natural freshwater lake in the West. The high quality waters of the Flathead Basin are recognized nationally and internationally. Flathead Lake is one of the three hundred largest lakes in the world and among the cleanest large lakes in temperate developed regions.

Scientific evidence suggests the lake is changing. Over the past decade, water quality has been declining in certain bays, at the center of the lake, and along the shoreline. Recent evidence indicates that this downward trend may be leveling off or even reversing at the center of the lake. However, the lake is still approaching a threshold. Unmanaged growth and increased development pose a serious threat.

Additional nutrients from any source could irreparably harm the lake. A loss of water quality could have serious repercussions for the economic vitality and quality of life of the region. A clean and healthy lake is critical to the social, economic, and cultural well-being of the area.

Although the Flathead Basin has a long history of activities to protect, maintain and restore water quality, few of these measures addressed the entire watershed. The watershed approach proposed by the Commission would build on existing control measures and address long-term, scientifically-developed pollution control goals. This approach will require more cooperation and coordination among stakeholders, recognize the shared responsibilities for management of the lake and its watershed, assign responsibility to all polluters in an equitable manner, and react proactively to changing conditions in the basin.

Objectives

- Use Clean Lakes Phase I and Total Maximum Daily Load (TMDL) studies to propose and establish water quality protection targets for nitrogen and phosphorus.
- Expand the existing FBC educational and public involvement process to educate basin stakeholders so they can make informed decisions to protect water quality and aquatic resources of the basin.
- Develop, coordinate and facilitate a community-based process that allows stakeholders to identify pollution sources and appropriate control measures.
- Identify and recommend fair methods for distributing the burden for reducing pollutant loads in the lake and watershed.
- Identify and recommend implementation strategies, such as cooperative agreements, regulatory measures, voluntary efforts, shared responsibilities, incentive programs, funding mechanisms, regulatory programs, and any needed institutional changes.
- Recommend lake shore and basin-wide erosion and sedimentation targets and control strategies. Acknowledge the linkage between air quality and water quality and evaluate methods to reduce air pollution.
- Acknowledge linkages between other activities in the basin and water quality in the lake, and evaluate methods to reduce the impact of these activities. Such activities include releases from Hungry Horse Dam, manipulation of the lake level by Kerr Dam, and destabilization of the food web in Flathead Lake brought on by the introduction of exotic species, most importantly *Mysis* shrimp.

The Blackfoot River
A Watershed Management Project

The Blackfoot River is a troubled river system. For more than 100 years the river and its tributaries have been dramatically influenced by land uses and abuses in the watershed. Mining, logging, and agricultural practices have degraded water quality, diminished fish habitat, and reduced food sources on which an historically abundant trout population depended for survival. In 1993, the Blackfoot was re-designated by the conservation group American Rivers as number 10 on the list of most endangered rivers in North America and remained on their threatened list in 1994. EPA has labeled the river "nationally significant," a designation indicating the magnitude of pollution problems in the drainage.

The MDHES Water Quality Division has documented water quality degradation throughout much of the watershed. In addition, the Department of Fish, Wildlife and Parks' data indicate fish populations and densities are far below those recorded only a decade ago. Water quality degradation is common throughout the watershed. Historic mining in the headwaters has contributed heavy metals to the system for nearly a century. More recently, improper land management practices have degraded water quality in both the

river and its tributaries. In addition to nonpoint source pollution from logging activities, sediment produced from grazing and hay production on private lands is a particularly difficult problem in the middle 80-mile reach of the river, especially impacting tributaries. Fisheries and aquatic life in these tributaries has improved recently but remains depressed.

The Blackfoot River valley is owned and managed by a variety of interests. The Forest Service manages 44% of the land, Plum Creek Timber Company - 20%, the State of Montana - 7%, the Bureau of Land Management - 5%, and private landowners - 24%. This diversity of ownership and interests presents a situation where coordinated resource management is needed to ensure that a balanced approach is maintained.

The Blackfoot Challenge was formed in 1992 as a consortium of landowners, industry representatives, conservation organizations and state and federal agencies concerned with proper resource use in the Blackfoot River watershed. The Challenge is one of the largest coordinated resource management efforts in Montana, both in the size of the watershed being addressed and in the numbers of entities involved. The Challenge soon realized that, just as a river system is a whole greater than its parts, so is the management of that system. The mission of the Challenge is to provide a forum that promotes cooperative resource management of the river, its tributaries and all adjacent lands through coordinated efforts that will enhance, conserve and protect the natural resources and rural lifestyle of the valley for present and future generations.

The Blackfoot Challenge has taken the lead in the development of a coordinated strategy to provide for the conservation and wise use of resources in the Blackfoot River watershed regardless of ownership. The Challenge has strived to involve **all** those who represent interests in the drainage. With the assistance and cooperation of private landowners, state and federal agencies, state and local conservation organizations, and others, the evolving watershed management strategy will be the basis for land management in the Blackfoot basin for years to come. An unprecedented, coordinated resource management effort is under way.

A number of stream improvement projects have been initiated within the past two years. The Water Quality Division has teamed up with the Big Blackfoot Chapter of Trout Unlimited, EPA, the Department of Fish, Wildlife and Parks, the U.S. Fish and Wildlife Service, the National Fish & Wildlife Foundation, the Orvis Company, the Soil Conservation Service and private landowners to implement six sub-watershed projects at a cost of more than $1.3 million. The results of the projects have been substantial. For example, improvements in grazing and irrigation water management reduced sediment production in Rock Creek by more than 50% and increased rainbow trout production by more than 880% in only two years. In each of the projects undertaken, the application of best management practices, particularly improvements in riparian and upland grazing management, has reduced nonpoint source pollution in each of the selected tributaries and increased fish spawning and rearing habitat in those streams. Such results have meant increased landowner acceptance of prescribed BMPs because they can readily see positive results to their operation and to the resource.

The Blackfoot River valley will be one of the first watersheds in which "capacity building" will be implemented to strengthen the ability of the Challenge to organize the technical and financial resources to develop and implement a watershed plan. By providing the local people with the skills and resources needed to initiate the planning effort, and utilizing agency staff for guidance and technical assistance, the watershed plans will be more readily accepted.

The troubled Blackfoot River watershed is certain to face continued old and new threats in the future. In addition to the continuing heavy metals water quality problem in the headwaters, a major gold mine is proposed adjacent to the upper watershed that would employ the cyanide heap leach extraction process less than a quarter mile from the river and several tributaries. Many people believe the potential for contamination to surface and groundwater is significant. Further, while logging and agricultural practices have improved in the recent past, there is a need to accelerate the application of best management practices to curb further water quality degradation.

The Blackfoot River, through the application of watershed protection and improvement principles, is well on its way to becoming another model watershed in Montana.

Grassroots Planning Process
Upper Clark Fork Basin

The upper Clark Fork River Basin of western Montana has long suffered from the over-appropriation of water for irrigated agriculture. The result has been serious stream dewatering problems which compromise all beneficial uses of the basin's water resources. Depletion of summer streamflows increases the impacts of wastewater discharges, elevates water temperatures, stimulates growth of nuisance algae, lowers dissolved oxygen content, and damages fish habitat. Some reaches of the upper Clark Fork and a number of

its tributaries have nearly gone dry in recent years.

Two years ago, the battle lines were drawn for a showdown between competing water use interests in the upper Clark Fork Basin. A formal contested case hearing was scheduled which pitted the Montana Department of Fish, Wildlife and Parks and others interested in supporting protection of instream flows against the Granite Conservation District and supporters seeking to reserve water for additional irrigation development. Fortunately, the battle never took place.

Instead, Clark Fork water users and managers sat down at the negotiating table to talk, and more importantly, to listen. The group was facilitated by Northern Lights Institute, a non-profit group that specializes in conflict resolution pertaining to natural resource issues. Several months later, an agreement was reached and legislation was prepared and passed by the 1991 Montana Legislature.

Parties to the agreement included irrigators, recreational and environmental groups, hydroelectric utilities, water user groups, and state and local water management agencies. Through the legislation, sponsored by Senator Tom Beck of Deer Lodge, a moratorium was declared on the issuance of most new surface water rights until June 30, 1995. It also created the Upper Clark Fork Basin Steering Committee and charged it with preparing a water management plan that would consider and balance all beneficial water uses in the basin above Milltown Dam near Missoula. The plan, which must be presented to the legislature and the governor by the end of 1994, must also contain a recommendation concerning the water rights moratorium and make recommendations for resolving water issues in the basin.

During its first year, the steering committee reviewed Montana water rights and water quality statutes, and heard briefings on Superfund activities, agricultural water use patterns, and other issues and concerns. Members also toured the Clark Fork River and some of its tributaries to view firsthand water use practices, problems, and examples of cooperative problem solving. They then began development of a work plan to guide formulation of the water management plan.

During the past year, the committee held a series of six public meetings throughout the basin to brief local residents and water users about the planning process and to invite their participation. Subsequently, six watershed committees composed of local residents and water users were established to identify specific problems and potential solutions in various reaches of the basin and to develop a dispute resolution process. This information, to be developed, will be at the core of the management plan. The steering committee will integrate the information from all six watershed subgroups into a coordinated management scheme. The approach emphasizes public involvement and local solutions to local problems rather than bureaucratic regulation.

Tri-State Clark Fork-Pend Oreille Watershed Management Plan

The Clark Fork-Pend Oreille Basin encompasses about 25,000 square miles of western Montana, northern Idaho and northeastern Washington. The Clark Fork River begins along the west slopes of the Continental Divide near Butte and drains most of western Montana before entering Idaho's Pend Oreille Lake. The lake is the source of the Pend Oreille River in northeastern Washington, which in turn drains into the Columbia River. All together, the Clark Fork-Pend Oreille Basin envelopes parts of two EPA Regions, three states, 18 counties, and several Indian reservations. The inter-connectedness and expanse of water resources in the basin when coupled with the multitude of political boundaries contribute to a challenging watershed management situation. However, the recent completion of a cooperative, basin-wide water quality assessment and the development of the Clark Fork-Pend Oreille Basin Tri-State Watershed Management Plan sets the stage for an innovative and comprehensive watershed management approach in this basin.

Concerns about environmental problems in the Clark Fork-Pend Oreille Basin are not new, but in the past decade there has been increased public attention on water quality degradation and the need for a basin-wide approach to water quality management. In 1987, Congress responded to this increasing public interest by directing the U.S. Environmental Protection Agency to conduct an assessment of the extent and sources of cultural pollution in the three-state drainage basin area and to develop recommendations for pollution control. This mandate appeared in Section 525 of the 1987 federal Clean Water Act. Funding was subsequently appropriated for a three-year study beginning in 1988. State agencies were assigned responsibility by EPA to conduct investigations within their state boundaries, with project oversight and coordination provided by an interstate steering committee.

The Section 525 assessment focused on the basin's most significant interstate water quality problem -- excessive nutrients and resulting cultural eutrophication, or enrichment. Eutrophication manifests itself in the Clark Fork River in Montana as abundant growth of nuisance attached algae that impairs most designated uses

of the river. In Idaho's Pend Oreille Lake, increasing growths of algae and other water plants and decreasing water clarity, especially in near-shore areas, were primary concerns. Pend Oreille Lake receives about 90% of its water from the Clark Fork River. In Washington, the Pend Oreille River is choked with nearly continuous growths of Eurasian milfoil that impede boat traffic and most other uses. Further, a growing human population of the entire region poses a threat of increasing eutrophication problems in the near future.

Each state team outlined research objectives specific to the water quality problems of its part of the basin while keeping in mind the basin-wide nature of the project. Each state then conducted studies to meet those objectives. Montana studied the Clark Fork River, Idaho evaluated the condition of Pend Oreille Lake, and Washington focused its research on the Pend Oreille River. MDHES, as the lead Montana state agency for the Section 525 Project, formulated a plan to: 1) determine the extent and magnitude of excessive algae production in the Clark Fork River, 2) identify and measure nutrient sources, and 3) develop nutrient level/biological response criteria. This information, together with Idaho and Washington study results, provided the basis for the development of water quality objectives and management alternatives for control of the eutrophication problem.

The Clark Fork-Pend Oreille Watershed Management Plan is based on a comprehensive watershed protection approach: water pollution problems are most effectively addressed by dealing with the entire watershed -- not just one river, tributary, or lake -- and by dealing with all sources of pollution in that watershed -- not just a select few. Another basic premise is the involvement of the watershed's stakeholders in affecting change and in developing solutions to pollution problems, rather than fostering an over-reliance on state and federal agencies.

The tri-state management strategy began with the formulation of water quality management objectives for the basin:

- control nuisance algae in the Clark Fork River by reducing nutrient concentrations;
- protect Pend Oreille Lake water quality by maintaining or reducing current rate of nutrient loading from the Clark Fork river;
- reduce nearshore eutrophication in Pend Oreille Lake by reducing nutrient loading from local sources; and
- improve Pend Oreille River water quality through macrophyte management and tributary nonpoint source controls.

To achieve these objectives, each state outlined numerous specific management actions. These alternatives were the focus of a series of public meetings held throughout the basin, which ultimately led to the development and adoption of more than 70 recommended management actions in the final plan. Ten action items were prioritized by the steering committee for immediate attention:

- convene a Tri-State Implementation Council to implement the management plan recommendations;
- establish a basin-wide phosphate detergent ban;
- establish numeric nutrient loading targets for the Clark Fork River and Pend Oreille Lake;
- develop and maintain programs to educate the public on its role in protecting and maintaining water quality;
- control Eurasian milfoil by education, rotovation (mechanical harvesting), and research into alternative methods;
- install centralized sewer systems for developed areas on Pend Oreille Lake;
- institute seasonal land application and other improvements at the Missoula wastewater treatment facility;
- enforce existing regulations and laws consistently and aggressively, particularly state anti-degradation statutes;
- establish and maintain a basin-wide water quality monitoring network to assess effectiveness and trends and better identify sources of pollutants; and
- develop and enforce stormwater and erosion control plans and county ordinances.

Key to the ultimate success of the management plan in restoring and protecting basin-wide water quality is the Tri-State Implementation Council. The Council was organized and met for the first time in early fall of 1993. Members of the group include city and county officials, businesses and industry, citizen groups, tribes, the states' water quality agencies and EPA Regions VIII and X. This Council will be responsible for building strong support for the plan, coordinating various implementation activities, developing timetables, identifying funding opportunities, reviewing or revising implementation strategies and providing a forum for public input and support. Most importantly, the Council will provide oversight and guidance to a set of locally based *ad hoc* work groups that will tackle the nuts-and-bolts work of implementing the specific action items at the local level. These work groups will disband as their specific tasks are completed, as opposed to the Council which will continue to steer the project and provide long-term continuity. In four short months since its inception, the Council has

already made impressive progress toward implementing the plan.

The Clark Fork-Pend Oreille Basin project is a good example of how effective a holistic watershed management approach can be. By taking a "big picture," watershed-wide approach to problem identification and planning and coupling it with stakeholder involvement and a locally based approach to problem solving, you develop a winning combination that promises results. The approach insures consensus, maximizes efficiency, avoids the common syndrome of well-intentioned groups working at cross-purposes or duplicating efforts, and creates a kind of synergism and energy that far surpasses any potential combination of individual actions. The watershed protection approach is definitely here to stay.

Water Resources Management in the Kootenai River Basin

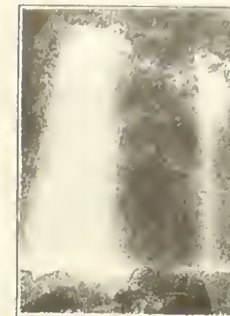
Every watershed planning initiative presents its own unique set of challenges and opportunities. At the heart of the previously described planning effort in the upper Clark Fork Basin lies the challenge of resolving conflicts between traditionally adversarial water user groups. The tri-state Clark Fork-Pend Oreille watershed management plan had to transcend state, county and tribal boundaries and deal with two river systems and a major lake. In the Kootenai Basin of western Montana, a group called the Kootenai River Network is tackling the challenge of developing a comprehensive watershed protection strategy for a watershed that is both interstate **and** international in character.

The Kootenai River originates in Kootenay National Park in the Canadian province of British Columbia and courses through northwestern Montana and northern Idaho before returning to British Columbia and its famous Kootenay Lake. The length of the mainstem alone is 485 miles and the total drainage area is about 18,000 square miles. The river basin also has a rich Native American heritage and encompasses several Indian reservations and aboriginal territories. It is one of Montana's largest rivers and one with a very limited amount of monitoring information to guide management decisions. While water quality is generally considered to be high, a number of issues and concerns have been raised by basin residents in recent years. These include: 1) the effects of historic, current and planned mining in the basin, 2) the decline of white sturgeon and bull trout, 3) reports of tainted, off-flavor fish, 4) concerns related to the operation of Libby Dam, 5) the cumulative effects of widespread logging, 6) a Superfund site and industrial discharge at Libby, and 7) clearcut logging, pulp mill and other industrial discharges, and mining upstream of the Montana border in Canada. Increased interest in the Kootenai River has prompted EPA to designate the watershed as a priority waterbody, along with the Clark Fork and Blackfoot rivers.

Initially formed in November 1991, the Kootenai River Network is an alliance of state, federal and provincial government agencies, Indian tribes, citizen groups, private businesses and the general public. The group was originally convened and chaired by a citizen's organization, the Cabinet Resource Group. The initial emphasis of the group was on information sharing to improve coordination between the government agencies. A longer-term goal was to pursue the development of a coordinated and comprehensive interstate-international water quality monitoring strategy for the entire basin. Following a number of quarterly meetings of the group, a broader vision emerged. With the help of an EPA grant administered by the Montana Water Quality Division, a contractor was selected and hired by the Network to develop a water quality status report on the basin. The recently completed report is to serve as a starting point for the development of watershed management goals and objectives for the Kootenai Basin and the development of a comprehensive watershed protection strategy.

Another project of the Kootenai River Network has been the initiation of a citizen's adopt-a-stream project. With additional financial assistance from EPA, formal training was provided for prospective volunteers in summer 1993. Since then, monitoring projects have been started on at least eight streams in the Kootenai drainage. The list is expected to grow because monitoring trainees pledged to put on similar training for other interested volunteers as a condition of their enrollment in the training course. The ultimate goal of the Network is to eventually have monitoring in place in every significant tributary drainage in the Kootenai Basin -- a lofty goal considering the size of the watershed.

At its winter 1994 meeting, the Kootenai River Network will review the final basin water quality status report and develop watershed management goals and objectives. It will also discuss funding for a professional Network facilitator and ways of increasing public outreach to involve more of the basin's stakeholders. The Network's approach of developing a solid foundation upon which to build should serve it well as it pursues a watershed protection strategy for this interstate and transboundary drainage.



SPECIAL STATE CONCERNS & RECOMMENDATIONS

Montana is fortunate to have a large number of pristine streams, lakes, and aquifers and a low population with little heavy industry. However, as population rises and demands upon the state's natural resources increase, maintaining the quality of Montana's waterbodies and aquifers will become more difficult. The major goals of Montana's water quality programs are to maintain the high quality of Montana's lakes, streams, wetlands and groundwater and at the same time return impaired waterbodies and aquifers to their natural condition.

Specific areas of concern include the effects of mineral extraction on pristine mountain streams and aquifers, logging of steep slopes and in riparian areas, coal strip-mining in semi-arid eastern Montana, impacts of present agricultural activities including saline seep, stream dewatering and sedimentation, increased residential development in riparian areas along streams and lakes, the impact of subdivisions on surface and groundwater, storm water and industrial wastewater discharges into Class V injection wells, contaminants leaching into ground water from inactive waste disposal sites and spills, the impacts associated with the operation of dams, atmospheric deposition of dust and smoke (nutrients) on lakes, and the increased recreational demands being made upon a finite aquatic resource.

The upcoming re-authorization of the federal Clean Water Act will place new demands on the state. For the state to comply with new programs and reporting requirements financial assistance from the U.S. EPA must be obtained and the Montana Legislature must authorize sufficient employees to operate the programs.

To comply with the §303(d) listing requirements and TMDL development continued technical assistance and implementation guidance is needed from the EPA.

To meet these challenges, Montana's water quality protection programs will need to grow and become more sophisticated. This will require additional funding (state and federal) and a pay scale that attracts and retains highly qualified professionals.

Because nonpoint sources of pollution account for the majority of the impaired surface waters in Montana, emphasis should be given to restoring impaired waters and protecting high quality waters threatened by agriculture, mining, forest practices, subdivision development and other nonpoint sources. This may be best accomplished through coordinated watershed planning that includes provisions for MPS pollution control.

To adequately measure the effectiveness of the state's nonpoint source control program and other water pollution control programs would require a greatly expanded monitoring and assessment effort. To date, only 10% of the states stream miles and 2% of the lakes have been assessed. Fixed-station monitoring in Montana is limited to three of the state's 16 river basins: the Flathead and upper and lower Clark Fork basins. The department will ask the legislature to fund additional staff and operating expenses to expand ambient monitoring in the state.

The U.S. Geological Survey has announced that it is likely to discontinue the National Stream Quality Accounting Network (NASQAN) in the United States, including the 15 sites in Montana. NASQAN is a nationwide water quality data collection network that is designed to meet many of the information needs of government agencies and other groups involved in regional water quality planning and management. Stations are typically located at the downstream ends of hydrologic units, making them especially useful for watershed management projects. Most stations in Montana have been operated continuously for 25 years or more. Outside of the Clark Fork River Basin, NASQAN stations are the only source of long-term water quality trend information in Montana.

Securing adequate long-term funding is critical for the success of state water quality protection programs. Congress should appropriate the full amount authorized by the Clean Water Act.

A special concern regarding new mandates resulting from Clean Water Act re-authorization is that the EPA needs to be flexible and allow the state to administer programs to best meet the needs of the state without undue control by the EPA. Rigid EPA direction of programs that do not address the needs of the state will be counter productive.

Acronyms and Abbreviations

ANC - Acid-Neutralizing Capacity

BLM - Bureau of Land Management

BMP - Best Management Practices

CECRA - Comprehensive Environmental Cleanup and Responsibility Act

CFR - Code of Federal Regulations

CFLI - Canyon Ferry Limnological Institute

CS&KT - Confederated Salish and Kootenai Tribes

CWA - Clean Water Act

DFW&P - Department of Fish Wildlife & Parks

DHES - Department of Health and Environmental Sciences

DHES/WQD - Department of Health and Environmental Sciences /Water Quality Division

DNRC - Department of Natural Resources and Conservation

DO - Dissolved Oxygen

EPA - Environmental Protection Agency

FBC - Flathead Basin Commission

LA - Load Allocations

MCL - Maximum Contaminate Level

MCPA - a phenoxy herbicide

MOS - Margin of Safety

MPDES - Montana Pollution Discharge Elimination System

NPDES - National Pollution Discharge Elimination System

NPS - Nonpoint Source

PSA - Public Service Announcement

PWS - Public Water Systems

RTI - Research Triangle Institute, NC

STORET - An EPA supported national water quality database

SWAT - EPA TMDL development assistance program

TDS - Total Dissolved Solids

TMDL - Total Maximum Daily Load

UM - Flathead Lake Biological Station

USFS - United States Forest Service

USGS - United States Geological Survey

WBS - Waterbody System

WLA - Waste Load Allocations

WQB - Water Quality Bureau

WQD - Water Quality Division

WWTP - Waste Water Treatment Plant

200 copies of this public document were published at an estimated cost of $2.25 per copy, for a total cost of $450.00, which includes $450.00 for printing and $.00 for distribution.